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TYPES OF STORMS OF THE UNITED STATES AND THEIR AVERAGE MOVEMENTS

BY

EDWARD H. BOWIE AND R. HANSON WEIGHTMAN

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ANNOUNCEMENT.

During the summer of 1913 the issue of the system of publications of the Department of Agriculture was changed and simplified so as to eliminate numerous independent series of Bureau bulletins. In accordance with this plan, among other changes, the series of quarto bulletins—lettered from A to Z—and the octavo bulletins—numbered from 1 to 44—formerly issued by the U. S. Weather Bureau have come to their close.

Contributions to meteorology such as would have formed bulletins are authorized to appear hereafter as Supplements to the Monthly Weather Review. (Memorandum from the Office of the Assistant Secretary, May 18, 1914.)

These Supplements will comprise those more voluminous studies which appear to form permanent contributions to the science of meteorology and of weather forecasting, as well as important communications relating to the other activities of the U. S. Weather Bureau. They will appear at irregular intervals as occasion may demand, and will contain approximately 100 pages of text, charts, and other illustrations. Supplement No. 1, "Types of Storms of the United States and their average movements," by District Forecaster Edward H. Bowie and his assistant, R. Hanson Weightman, is presented herewith.

C. F. Marvin,
Chief of Bureau.

TYPES OF STORMS OF THE UNITED STATES AND THEIR AVERAGE MOVEMENTS.

By Edward H. Bowie and R. Hanson Weightman.

Contents.

ORIGINS OF STORMS OF THE UNITED STATES.

Within the general or primary system of winds of the earth's atmosphere there are formed and carried along with the prevailing air currents secondary or local wind systems known as cyclones and anticyclones that are more commonly designated "lows" and "highs," respectively. Moreover, the general system of winds sustains other secondary wind systems of a subpermanent nature known as the "centers of action" or more or less permanent areas of low and high pressure. In the Northern Hemisphere these areas are as follows: The Aleutian and the Iceland lows and the highs over the middle latitudes of the Atlantic and Pacific Oceans and, in the winter months, the highs over Siberia and North America. Conspicuously abnormal pressures in the regions of these so-called "centers of action" are related to marked departures from normal weather and temperature conditions in the United States. Some authorities assume that these abnormal distributions of pressure are due to extraterrestrial and others to terrestrial influences. If it be true that the solar output is a variable quantity, it is possible that the solar variations are associated with marked changes in pressure in the "centers of action," and thus may be found a key for defining for considerable periods in advance the general

character of weather changes for a given region. If, on the other hand, abnormal pressure distributions occur with an unvarying solar radiation, the causes thereof must be traced to a terrestrial source. The varying effects of a nearly constant radiation on land and water surfaces and on air under different conditions of temperature, vapor content, dust content, etc., are sufficient in the minds of some writers to explain these phenomena.

Regardless, however, of the cause of abnormalities of pressure in the "centers of action," the importance of their relation to the character and paths of storms in the United States is well recognized and therefore should be carefully considered in day-to-day weather forecasting in the United States. To illustrate: Of the "centers of action" that affect the weather conditions of the United States east of the Rocky Mountains, the subpermanent high over the middle latitudes of the North Atlantic Ocean is perhaps most influential. When this is well developed and stable, temperatures above the seasonal average are to be expected over the great central valleys and the eastern and southern States, and areas of high and of low pressure crossing the United States will move in high latitudes and pass on to the ocean by way of the St. Lawrence Valley. In fact, all prolonged periods of heat in regions east of the Rocky Mountains occur simultaneously with the abnormal development of this subpermanent high. When, however, it is weak and ill-defined, cool weather prevails over the eastern half of the country. Moreover, it has also been observed that the courses and intensities of West India hurricanes are influenced by the location of this center and by its magnitude. Again, the variations in position and magnitude of the elongated subpermanent area of low pressure that normally extends from southeastern Alaska westward over the Aleutian Islands to Kamchatka have a decided influence on the character of and courses followed by storms that cross the United States. If this Aleutian low is north of its normal position, lows will move along our northern border; whereas, if it is south of its normal position, lows will move far south of their normal tracks and stormy weather with great alternations in temperature will occur over the United States. The paths of storms crossing the United States shift with the position of the Aleutian low. When after a period of indifferent pressure within the Aleutian area the pressure in this region begins to fall, a low will appear within 36 hours north of Montana and, as the Aleutian low deepens, lows will follow each other in rapid succession along the northern border until the pressure has begun to rise north of the Aleutian area and it (the Aleutian low) has moved south of its normal position when the tracks of lows in the United States will shift to lower latitudes. Finally, when the Aleutian low reaches its southernmost position, lows crossing the United States will make their appearance in the southern plateau region or over the Gulf of Mexico. Attention is invited to the Monthly Weather Review charts showing tracks of centers of low areas for each month for additional evidence of this interesting and important relation between the Aleutian low and the tracks of storms in the United States.

As before stated, lows in middle latitudes usually move as secondary wind systems toward the east, but not necessarily due east, in the general eastward drift of the atmosphere in these regions. It is not to be supposed that this eastward drift directly follows the parallels of latitude. Bigelow has claimed that it follows very closely the trend of the isobars at the 10,000-foot level. The lows, however, at times do not follow a due east course, and perhaps the most important cause of these variations is an abnormal distribution of surface pressure, although it is recognized that there may be marked variations in the so-called eastward drift both in direction and in velocity that enter into the causation of these abnormalities. Assuming that storms move toward the region of least resistance, it follows that the influence of the general eastward drift together with that of the surface inflowing streams of air from adjacent regions of high barometric pressure determine their courses. It is thought, however, that the distribution of temperature and the location of the attendant area of precipitation may have an influence in determining the direction of the storm's movement. These influences, however, are regarded as subordinate to those of the eastward drift and the effect of unequal pressure distribution in regions adjacent to and surrounding the storm center.

While there is doubt as to the nature of the processes that operate to initiate a cyclone, its local wind circulation and attendant weather and temperature changes after it is once formed are readily explained by hydrodynamic and thermodynamic laws that apply to atmospherics. A number of theories as to the origin of lows have their place in meteorology: (1) The formation of cyclones in pockets of warm, moist, quiet air is known as the convectional theory; (2) The driven-eddy theory; the formation of lows is sometimes ascribed to eddies formed in the general wind system, as in the case of a stream of water flowing into a quiet pond or two streams of water flowing past or over each other in different directions or with different velocities; and (3) The usual counter-current theory, according to which the lows have their origin in horizontal air currents of opposing direction and different temperatures. In all these theories the right-hand deflecting force in the Northern and the left-hand in the Southern Hemisphere, due to the rotation of the earth on its axis, determines the direction of rotation of the air around the center of a low.

Of the lows that cross the United States it is unquestionably true that many of them, especially in the winter season, have their origin in the Aleutian low and are offshoots therefrom. A day-to-day study of the daily Weather Map of the Northern Hemisphere through many years has lead us to this conclusion, and we believe others, studying this map as now published daily

will confirm it. Variations in the position and intensity of the Aleutian low have a pronounced influence in determining the immediate region where storms coming from western Canada or the Pacific Ocean will enter the United States.

STORM TYPES.

A storm that first appears over Alberta, Canada, differs in a number of ways from a storm that, for example, originates over the Gulf of Mexico. The usual method pursued in studying storms has been to divide them into types named after the regions in which the storms first make their appearance on the weather map, but it must not be inferred that the storms necessarily originated in the several regions. For example, one type of storm is called "Alberta" for the reason that this type first appears in that region on the daily weather map of Canada and the United States. As a matter of fact, nearly all storms of this type can be traced northwestward to Alaska and the Aleutian Islands, many of them no doubt being offshoots from the subpermanent area of low pressure that normally overlies these regions, particularly during the winter months. Similarly, our so-called North Pacific and South Pacific storms are probably secondaries that pass eastward from the Aleutian low when it is occupying a more southerly position than customary.

These regions are graphically shown on Chart 1. The types are as follows: The so-called Alberta, North Pacific, South Pacific, Northern Rocky Mountain Region, Colorado, Texas, East Gulf, South Atlantic, Central, and West India (hurricane).[1]

The Alberta type.—These disturbances are, no doubt, offshoots from the Aleutian low and appear over the region of Alberta usually within 36 hours after the pressure has begun to fall over Alaska. Normally these disturbances move eastward along our northern border, without widespread precipitation. Especially is this the case in the winter months when an area of high pressure persists over the Plateau and middle Rocky Mountain regions. As in the case of all storms that first appear in the far West, the most frequented track shifts southward after midsummer and northward after the late winter months. Some of the Alberta lows, particularly in the winter season, move far down the east slope of the Rocky Mountains to the West Gulf States and thence move northeast. In such cases it will be found that a high of considerable magnitude appeared over Alberta and forced the storm southward. This type of storm not infrequently is attended by a trough of low pressure that may reach as far south as Texas, and in such instances an extensive area of precipitation attends its eastward movement from the Great Central Valleys. The Alberta type of storm is prolific of secondaries and because of this fact has to be carefully watched by the forecaster, especially when it is attended by the trough phenomenon.

The North Pacific type.—Storms of this class usually make their appearance on the Washington and Oregon coasts and thence move eastward in widely different courses. There are two, however, that are often followed—one due east along the northern border and the other southeastward from the North Pacific States to the southern Plains States and at times quite to the Gulf coast and thence eastward or northeastward. During the time of appearance of lows of this type the Aleutian low is well defined, but somewhat south of its normal position, and the pressure is above normal over the interior of Alaska. The Alberta type of disturbance is no longer in evidence and in its stead the pressure is unusually high in that region, the northern Plains States, and in the region of the Great Lakes. A feature of the North Pacific storms is that they do not usually occur singly—that is, when this type appears the first storm will be followed by others of the same type. Frequently this storm prevails with great intensity on the north Pacific coast, but, unless it takes the southeastern track, it loses its marked intensity in crossing the Rocky Mountains. The precipitation attending these disturbances is usually general west of the Continental Divide, but east of the Rocky Mountains is most apt to occur to the north and along the immediate track of the storm's center. Decided cold waves from Alberta commonly follow this type of storm after it crosses the Rocky Mountains. This type not infrequently develops secondaries that overshadow in intensity and magnitude the main low. The following is a note on this type of storm by Garriott:

> Lows that string down the Rocky Mountains from the north Pacific are very tenacious and it is a several day job for any high, however large, to dislodge them. (See maps for January, 1909.) This condition produces general precipitation with abnormally low temperatures north of the belt of low pressure. Much care should be exercised to detect the formation of centers in the eastern end of this belt of low pressure. Watch the wind circulation which is independent of the small lows that are charted in the Rocky Mountain region, which are due to local high temperatures, and when they appear it is reasonably certain that a low will develop and move northeastward. In this event a cold wave is indicated that will sweep pretty far south. A sharp dip in the isotherms over the Plains States is also a good evidence of the breaking away of a low from the main belt of low pressure. (Also see maps of Dec. 6-8, 1902, and Dec. 1-7, 1909.)

The South Pacific type.—This type usually occurs in the winter months when the Aleutian low has been forced far south of its normal position and the pressure is high over Alaska and the western Canadian Provinces. At times these storms linger several days over the far Southwest, but are usually rapid movers, following a straightaway course to the east and east-northeast with widespread precipitation attending them. As this type usually occurs at times when cold waves threaten, heavy snowfalls are common immediately north of the track of the storm's center. This type of storm develops few secondaries. They usually occur singly—that is, it is not probable that a second storm of this type will follow the

[1] These titles are in common use at the Washington office of the Weather Bureau; they refer to divisions of North America *only*, and are abbreviated by omitting the word "States" (or "Province") when necessary, e. g., "South Pacific" is equivalent to South Pacific States, and other analogous divisions as shown on Chart 1 of this Supplement.

first one. A pronounced cold wave may be expected to occur immediately following a storm of this type, and its extension southward to the Gulf States is not uncommon.

The northern Rocky Mountain type.—This class of storms is somewhat similar to the Alberta type, but is relatively few in number. They are of small area and the track of greatest frequency is south of that commonly followed by Alberta storms. These storms usually move toward the Great Lakes, but not infrequently advance far to the south and there either dissipate or recurve to the northeastward. Ordinarily these disturbances are not producers of widespread precipitation, although in the winter season heavy snowfalls may occur in the northern Rocky Mountain region and the northern Plains States. Cold waves in the Northwest and the Plains States, however, usually follow this type of storm.

The Colorado type.—Storms of this type are exceeded in frequency only by the Alberta and North Pacific types. Many of the Colorado lows are developments within a trough that extends southward or southwestward from Alberta storms that move along the northern border. When this low develops, its parent low (the Alberta storm) usually loses intensity and disappears. The track of greatest frequency of Colorado storms is toward the Great Lakes, although in the winter season there is a decided looping southward over Oklahoma and thence the movement is east-northeast over the Ohio Valley. It is a well-established fact in regard to storms of the United States that the farther south a storm has its origin the more widespread is the area of precipitation attending it. Hence it will be found that this type of storm is a good rain producer. In the summer season it not infrequently happens that this type of storm, when it moves toward the upper Mississippi Valley, is the forerunner of a warm wave in the Middle West. In the spring months, disturbances of this type produce numerous thundershowers and severe local storms over the Great Central Valleys and the southern Plains, especially when the track of such a storm is toward the northnortheast.

The Texas type.—This type of storm is one of the easiest for the forecaster to handle. Its associated phenomena—widespread precipitation, strong winds, and temperature changes—are more uniformly alike than for any other class of storm. They usually form when the pressure is high over the Eastern and Northwestern States, are quick to develop and are steady and rapid travelers, following a course toward the northeast or eastward over the Gulf States and northeastward over the Atlantic seaboard. Many of these storms in the winter season are attended by heavy snows north of the track of the storm's center, and cold waves in the Southern States usually follow.

The East Gulf type.—This is in many respects similar to the Texas type, save that the place of origin is farther east. Storms of this type usually move rapidly northeast along the Atlantic coast and develop into severe storms over the Middle Atlantic and New England States, especially when an Alberta low is moving eastward along the northern border. The following pressure distribution is indicative of the development of a low over the East Gulf, although the weather map may present all the aspects of fair weather. An area of high pressure over interior districts, the crest of which is over the Rocky Mountain range with isobars trending north and south and with an extension eastward to the Middle Atlantic coast. The winds on the West Gulf are northerly and the high is moving toward this region. The winds over the East Gulf coast are northeasterly and the temperature is high over Florida. This is to all appearances a fair weather map for the Atlantic States, but in a number of instances a low has formed over the Gulf States that has caused rain or snow within 24 hours as far north as Maryland. (See maps of Nov. 15, 1908; Jan. 6, 1908; Nov. 12, 1904; Nov. 13, 1908; Nov. 27, 1912; and Oct. 19, 1913.)

The South Atlantic type.—Not considering tropical storms that first appear in this region, practically all storms of this type are secondaries that develop in troughs of low pressure that extend southward from storms that are approaching the Northeastern States from the west or northwest. Severe storms of this character not infrequently develop within 12 hours and produce destructive winds and, in the cold months, heavy snows in the Middle Atlantic and New England States. The key to the situation appears to be the position of the maximum 12-hour pressure fall in its relation to the position of the center of the parent low that is advancing from the west or northwest. If the fall be pronounced and some distance south or southeast of the low center, extreme caution should be exercised, for, if the winds in the Southeastern States at this time show a tendency to form a "whirl," a storm of marked intensity will quickly develop. The severe storm of March 4, 1909, was formed under these conditions, and counterparts occurred in November, 1907, in 1912, and in 1913.

The Central type.—This type of lows comprises a miscellaneous group of disturbances that are mainly secondaries that develop in troughs of low pressure or are minor developments that result from the counter flow of winds from migratory areas of high barometer. Such storms are usually of only moderate intensity, small area, and short duration.

The West Indian type.—Hurricanes are storms of great severity that have their origin near the Equator. They occur in the summer and fall months only, and their origin is within the area of calm, sultry, and rainy weather of the doldrums which, in this season of the year, lies north of the Equator and is bounded on the north by the northeast and on the south by the southeast trades. These southeast trades actually cross the Equator when the belt of calms is farthest north, and being deflected by the earth's rotation become south or southwest winds. It will be readily seen that ideal conditions exist in the doldrums for the formation of "whirls" in the lower strata of the atmosphere between the countercurrents. When a storm develops in this region, it is carried westward by the prevailing westward drift of the general or

primary circulation within the Tropics. The northeastward recurving of these storms is dependent on the pressure distribution over the eastern and southern portions of the United States. The magnitude and the position of highs over the United States and the western part of the North Atlantic Ocean determine the departures of these storms from normal courses.)

While the storms of the United States may very properly be classified as above, yet it must be patent that each type has its subtypes that differ not only in their rates and directions of movement but also in their associated wind, weather, and temperature changes. It is important that these types and subtype storms be classified and arranged for ready reference for use by officials of the Weather Bureau engaged in forecast work.

NORMAL 24-HOUR STORM MOVEMENTS.

Heretofore all published normal tracks of areas of low barometer have been presented as the tracks of greatest frequency followed by the several types of storms that cross the United States. This method was used by Dunwoody in the "Summary of International Observations" (U. S. Weather Bureau bulletin A, Washington, 1893), by Bigelow in "Storms, Storm Tracks, and Weather Forecasting" (Weather Bureau bulletin 114), and by Van Cleef in "Is There a Type of Normal Storm Path?" (Monthly Weather Review, Washington, March, 1908). Chart 1 illustrates the form generally used in presenting the normal storm tracks of the United States, but is based on newer material.

In a paper entitled "The Relation Between Storm Movement and Pressure Distribution"[3] the normal 24-hour movement by 5-degree squares was used. Strictly speaking, however, these normals presented the mean 24-hour drift of the atmosphere that carries the storm of any given square eastward, and therefore cannot be regarded as normal storm tracks. Moreover, these normals were compiled from all types of storms that moved over a given 5-degree square. No effort was made to separate the normals into types. They are therefore composite normals and not truly representative of the movement of any recognized type of storm.

The normals forming a part of this paper are for the several types of storms already described, that appear on the weather maps of the United States and are based on the records of all storms in the years 1892 to 1912, inclusive. Chart 1 shows the regions into which the United States and southern Canada have been divided for purposes of classification and for which the types of storms that cross the United States have been named. It will be noted that there are 10 divisions that have been designated, as follows: Alberta, North Pacific, South Pacific, Northern Rocky Mountain Region, Colorado, Texas, East Gulf, South Atlantic, Central and West Indies, the last-named region not appearing on this map.

[3] Bowie, Edward H., *in* MONTHLY WEATHER REVIEW, Washington, D. C., February, 1906, 34:61.

Table 1 gives the total number of storms by types for each month and for the year, and also the total number of storms for each month, including all types. The total number of storms discussed was 2,597.

TABLE 1.—*Number of lows of each type observed during the period 1892 to 1912, inclusive.*

Types.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Alberta	98	65	76	72	60	70	100	88	87	88	85	91	980
North Pacific	53	48	44	33	27	16	14	12	23	29	48	52	399
South Pacific	20	21	24	18	25	8	7	7	8	16	13	16	183
Northern Rocky M't'n	8	5	6	11	15	10	11	18	13	10	9	5	127
Colorado	30	31	39	28	30	25	19	20	14	36	23	23	318
Texas	32	32	28	20	15	9	5	5	7	15	21	53	242
East Gulf	8	10	9	7	4	4	2	1	8	8	8	4	73
South Atlantic	8	4	6	12	7	6	3	3	4	10	17	7	87
Central	10	14	15	15	21	23	20	20	18	6	20	9	188
Total	267	230	247	216	204	177	181	174	178	217	241	261	2,597

Table 2 gives for each of the nine types of storms the average daily movement in miles (as found by taking the distance in a straight line from the center of the low at one observation to its center 24 hours later) for each month and for the year.

Tables 3 to 14 give for each type of area of low barometer by months and for each 5-degree square the following: (1) The number of storm centers observed within the square at 8 a. m. or 8 p. m., seventy-fifth meridian time; (2) the average azimuth of the position of all lows 24 hours after being observed within the square in degrees reckoned from the north as zero through east; thus, an entry of 105° means that the average position of the lows at the end of 24 hours is toward 15° south of east; and (3) the average 24-hour movement in miles (in a direct line—center to center) of all lows of the given type which were observed within the 5-degree square.

Charts 2 to 109 show the average 24-hour movement for each 5-degree square by months for each of the nine first named types of storms. The figure at the center of the square indicates the number of observations upon which the direction and length of the vector are based. The length of each vector is proportional to the number of miles of storm movement as defined above, the direction being indicated by the arrow.

It is believed that the normals forming a part of this paper have decided advantages over those prepared under the former method for showing normal storm tracks. Whereas the former method showed only the most frequented track, the form of presentation herein employed shows the normal 24-hour movement for every square in which a storm of the given type has appeared. For instance, on Chart 1 the most frequented path of Alberta storms in January is directly eastward along the northern border. Storms of this type not infrequently in their movement across the United States pass southeastward to the lower Missouri Valley and thence eastward or northeastward to New England and they occasionally move still farther south, even as far south as the Gulf coast and thence eastward. The method which charts

the average track gives no clue to the direction of movement of a storm after departing from the path of greatest frequency. Chart 2, however, shows the average movement of Alberta storms, not only in the path of greatest frequency along the northern border, but for all other possible positions as well.

To illustrate the use of the normals: Assume that the storm is of the Alberta type for January and that its center is in the center of the square bounded by the meridians 105° W. and 110° W. and by the parallels 45° N. and 50° N. If the storm follows a normal course, its center 24 hours later will be in approximately longitude 93° W. and latitude 42° N. Again, after another 24 hours, if it follows a normal course, its center will be in approximately longitude 79° W. and latitude 44° N., and so on until the storm has passed off the map. In determining a possible deviation from a normal course, unequal pressure distribution in the regions adjacent to the storm center, the region of maximum 12-hour pressure fall, and the trend of the isotherms should be carefully considered. Also, the magnitude of the rise and fall in pressure in the surrounding regions should be carefully noted, as it is a well-established rule in forecasting that the rate of movement of a storm center has a direct relation to the magnitude of the pressure fluctuations as shown by the pressure-change chart.

It seems apparent that the present scheme is a decided improvement over the former methods of presenting storm tracks, especially in connection with the study of weather maps with the object of making forecasts, and unquestionably will present to the forecast officials of the Weather Bureau information that will be of material aid in day to day forecasting, the chief consideration, in fact, that has led to the preparation of these normals.

The mean 24-hour movement of West India hurricanes was computed for each 2½-degree square for the period 1873 to 1910, inclusive. As the 2½-degree square is small and the direction and magnitude of storm movement in adjacent squares is not altogether uniform, it was necessary to smooth the values of the individual squares by taking the mean of the eight surrounding squares, together with the value of the individual square, giving proper weight to the number of observations in each square and computing a revised or smoothed value for the individual square. The vectors on charts 110 to 114, inclusive, give in a graphic manner the results obtained.

TABLE 2.—*Approximate average 24-hour movement, in miles, of each type of storm during 1892–1912, and the number of observations of each.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Means.
Alberta type:													
24-hour movement (miles)	738	679	664	555	507	480	528	480	575	614	683	737	602.7
Number of observations	*531*	*404*	*475*	*521*	*585*	*466*	*568*	*575*	*563*	*513*	*529*	*502*	*6,032*
North Pacific type:													
24-hour movement (miles)	756	708	689	518	474	432	500	450	555	540	649	721	626.8
Number of observations	*365*	*392*	*322*	*283*	*219*	*177*	*116*	*100*	*189*	*213*	*375*	*390*	*3,141*
South Pacific type:													
24-hour movement (miles)	749	703	640	557	456	525	529	547	473	523	617	654	592.4
Number of observations	*151*	*178*	*182*	*171*	*209*	*56*	*52*	*76*	*79*	*118*	*118*	*127*	*1,517*
Northern Rocky type:													
24-hour movement (miles)	699	756	715	532	450	467	545	513	509	536	640	870	548.0
Number of observations	*48*	*31*	*26*	*65*	*113*	*121*	*70*	*128*	*85*	*60*	*59*	*28*	*834*
Colorado type:													
24-hour movement (miles)	725	657	654	499	524	484	563	502	611	563	654	677	592.9
Number of observations	*155*	*174*	*212*	*187*	*175*	*154*	*124*	*145*	*94*	*200*	*147*	*167*	*1,934*
Texas type:													
24-hour movement (miles)	749	700	742	616	511	579	480	373	380	531	624	757	656.8
Number of observations	*220*	*150*	*135*	*99*	*98*	*49*	*27*	*33*	*38*	*104*	*139*	*246*	*1,338*
East Gulf type:													
24-hour movement (miles)	772	672	633	502	441	398	158	680	486	600	608	740	580.7
Number of observations	*38*	*30*	*23*	*23*	*22*	*21*	*6*	*5*	*58*	*35*	*49*	*19*	*329*
South Atlantic type:													
24-hour movement (miles)	768	561	577	421	548	398	396	700	688	514	525	656	554.0
Number of observations	*31*	*18*	*22*	*24*	*20*	*23*	*12*	*5*	*8*	*40*	*73*	*24*	*300*
Central type:													
24-hour movement (miles)	798	724	706	568	525	529	468	495	503	554	606	557	561.2
Number of observations	*32*	*25*	*51*	*69*	*90*	*106*	*72*	*94*	*75*	*36*	*111*	*53*	*814*
Mean 24-hour movement (miles)	744.8	689.9	673.1	542.1	492.1	479.7	521.3	488.7	549.0	570.9	645.9	718.0	602.4
Total number of observations	*1,571*	*1,402*	*1,448*	*1,442*	*1,331*	*1,173*	*1,047*	*1,161*	*1,189*	*1,319*	*1,600*	*1,556*	*16,239*

NOTES ON WEATHER FORECASTING.

The forecaster from time to time makes mental notes on the peculiar behavior of storms and their associated phenomena, but unfortunately such notes are seldom put into print for the guidance of those who subsequently take up this work. The following are a number of such observations collected by Mr. Edward H. Bowie:

LOWS.

North Pacific lows.—"Lows that string down the Rocky Mountains from the North Pacific are very tenacious, and it is a several days' job for any high, however large, to dislodge them." (Garriott.) This condition produces general precipitation with abnormally low temperatures north of the belt of low pressure. Much care must be exercised to detect the formation of centers in the eastern end of this belt of low pressure. Watch the wind circulation, which is independent of the small lows due to local high temperatures that are charted in the Rocky Mountain region, and, when one appears, it is reasonably certain that a low will develop that will move northeastward. In this event a cold wave is indicated that will sweep pretty far south. A sharp dip in the isotherms over the Plains States is also good evidence of the breaking away of a low from the main belt of low pressure. (See maps of January, 1909; also Dec. 6-8, 1902, and Dec. 1-7, 1909.)

South Atlantic and East Gulf lows.—In these regions lows at times form when there is an area of high pressure

over interior districts, the main center of which is over the Rocky Mountain region with isobars trending north and south and with a tongue or extension eastward to the middle Atlantic coast. The winds on the West Gulf are northerly and the high is moving toward this region. The winds over the East Gulf coast are northeasterly and the temperature is high over Florida. This is to all appearances a fair weather map for the Atlantic States. Under this pressure distribution, however, a low has formed in several instances over the Gulf States that has caused rain or snow within 24 hours as far north as Maryland. (See maps of Jan. 6, 1908, October, 1908, Nov. 13, 1908, Nov. 12, 1904, Nov. 27, 1912, and Oct. 19, 1913.)

West and southwest lows.—(*a*) Such lows form after the passage of an Alberta storm over the Lakes and will develop rapidly if the temperature is high and rain is falling in the West Gulf States. If the temperature is moderate and the high area in the southeast is giving way, the storm will be forced to the Gulf and be dissipated. High temperature in the southwest and high pressure in the east and southeast are favorable for such storm developments. (See maps of Jan. 8, 1901, and Jan. 19, 1907.)

(*b*) When there is an area of high pressure over the southeast and a cold wave in the northwest threatens, there will be a storm development in the southwest and precipitation will be general. (See maps of Dec. 14, 1906, Dec. 27, 1906, Jan. 20, 1904, Jan. 25, 1904, and Jan. 8, 1901.)

(*c*) A fast moving storm from the west or southwest is followed by another disturbance that usually develops to the east and south of the position where the preceding disturbance developed. (See maps of Dec. 2–4, 1902, and Jan. 21, 1904.)

(*d*) If a storm form in the southwest and it is forced to the left of the normal track, another storm will immediately begin to develop in the southwest and it becomes a sure rain producer. Storms that develop in the southwest and move normally are quickly followed by clearing weather.

(*e*) Frequently a number of storms in sequence have their origin in the same locality. Such takes place in the southwest when the pressure continues high in the southeast. These developments will continue until a high of considerable strength moves southeastward from the northwest, after which lows will move out of the northwest along the Canadian border. (See maps[a] of Dec. 18–24, 1905, Dec. 8–18, 1907, Dec. 1–7, 1909, and Jan. 16 (p. m.) to 31, 1902.)

Lake Regions storms.—A development over the Great Lakes is indicated by a retardation of the cold change and cloudiness hanging on. (See maps of Jan. 7, 1901, Jan. 15, 1901, Jan. 30 (p. m.), 1901, Jan. 10, 1902, and Jan. 7, 1908.)

Storms of great depth.—In the Plains States the Rocky Mountain and Plateau regions lose intensity as a rule after reaching the Mississippi Valley or the Lake region, and their movement is then slow. Storms of marked intensity in the Atlantic States either originate in the south or southwest or else come through from the west as moderate disturbances until the Eastern States are reached. (Garriott.) The western and northwestern disturbances when they become intense in the Eastern States are usually preceded by an abnormal fall in pressure extending far to the southeast of the storm center. (See maps of Nov. 15, 1906, Jan. 19, 1907, and Jan. 19, 1903.)

Trough formation.—(*a*) When a northwest low shows greatest pressure fall in the middle Rockies, the main storm will appear in the southern end of the trough in 24 hours, forming the southern end of the trough rather than having a circular form. (Cox.) (See maps of Nov. 3 (p. m.), 1905, Jan. 25 (p. m.), 1903, Jan. 9, 1904, and Jan. 10 (p. m.), 1904.)

(*b*) Troughs of low pressure moving from the west are of two types—the narrow and the wide. The former moves eastward slowly and storm centers form in the extreme northern and the extreme southern ends. They never form in the middle of the trough where it is narrowest, but do form where the isobars of approaching and receding highs bend away from each other. (See maps of Nov. 6 (p. m.), 1906, and Dec. 13, 1901.) When the trough is wide, the development of an extensive storm area is not uncommon, especially if the wide intervening area between the highs shows relatively high temperatures. (See maps of Nov. 25, 1906, Jan. 28 (p. m.), 1901, and Jan. 10, 1904.)

(*c*) When the northern end of a trough moves eastward faster than the southern end, the weather conditions in the south and southwest remain unsettled and the chances are that a storm will form southwest of the high that follows. Generally a period of unsettled weather follows without marked temperature changes. (See map of Nov. 27, 1904.)

When the southern end moves as fast or faster than the northern end, settled weather follows. (See map of Dec. 24 (p. m.), 1902.)

It appears, in the former case, that the current of air from the northwest is weak and is deflected northeastward, whereas in the latter case the stream of air from the south on the east side of the trough is the weaker of the two.

(*d*) In a Plateau trough having storm centers in the northern and the southern ends, the northern end usually moves eastward faster than the southern. If there be a high of any consequence in the rear, the southern center will pass eastward across the Gulf States but, if there be no high in the rear, it will likely move northeastward. If the southern storm of such a trough be depressed or forced southward and the high from the northwest or west moves eastward assuming an oval form, cloudiness will increase and showers begin shortly after the center of the high passes. This is a certain rain condition.

Increasing storms.—(*a*) Usually a storm that moves to the left of its normal track increases in intensity. (See maps of Jan. 2, 1903, and Apr. 29, 1909.)

[a] The 8 p. m. daily weather maps referred to here and below exist in MS. form only.

(*b*) Other storms that increase in intensity appear to depend on marked horizontal temperature gradients. A rapid temperature rise in front of a storm implies an increase in intensity, especially if the temperature is falling rapidly over the northwest.

Sharp temperature rises in the eastern quadrants of a storm are a sure indication that the storm will move northeastward and increase in intensity. The supposition is that the sharp rise in temperature is an indication of powerful southerly winds in these quadrants which will deflect the storm to the left of the normal track. This takes place despite the apparent unequal pressure distribution.

(*c*) When the center of the maximum 12-hour pressure fall is southeast of the storm center, the storm will show a marked increase in intensity. This does not apply to West Indian hurricanes nor to storms from the southwest or south. (See maps of Dec. 23 (p. m.), 1902, Jan. 21, 1904, Jan. 26, 1904, and Jan. 9, 1907.)

(*d*) When the 12-hour pressure fall area is circular, the storm increases greatly. (See map of Dec. 12 (p. m.), 1907.)

(*e*) An area of high pressure moving southward or southeastward in advance of a storm indicates an increase in the storm's intensity. (See maps of Dec. 5 (p. m.), 1907, Dec. 28, 1906, and Dec. 4, 1906.)

Pressure changes (*12- and 24-hour*).—(*a*) There are indications that pressure-fall areas moving southward diminish and are indicative of cool weather. They occur when pressure is low over the western Atlantic Ocean. Areas of pressure-rises moving southeastward on the map are indicative of warm and dry weather to the east and southeast of the following area of falling barometer. Pressure-rises moving southward and southeastward indicate fair weather, while those moving eastward and northeastward indicate unsettled weather.

(*b*) Pronounced 12-hour rises swinging toward the southeast and then back to a northeast course while advancing rapidly are usually indicative of unsettled weather. In this case a low will follow it from the southwest and rain or snow will set in over the Eastern States within 24 hours after the area of rising pressure reaches the New England States and the St. Lawrence Valley. (See maps of Dec. 16, 1905, and Dec. 11, 1907.) An exception is where the 12-hour rise swings far south over the Gulf States and thence up the Atlantic coast; then the following low comes from the west along a nearly east course, disappears off the middle Atlantic coast, and is followed by fair and colder weather. (See maps of Dec. 2–4, 1902, Dec. 10, 1905, and Dec. 12, 1905.)

(*c*) When the pressure rises on the south and southwest of a high, it indicates a further building up of the high and its slow movement, usually toward the southeast. (See map of Jan. 1, 1904.)

(*d*) The position of the area of maximum 12-hour pressure change is very significant for future storm developments. Pressure-fall in the rear of a storm indicates slow clearing and slow movement of the storm. When the pressure-fall is great and the center of greatest fall is near the storm center, a rapid increase in intensity may be looked for. When the fall extends far in advance of the storm center, the storm movement will be slow.

Secondaries.—(*a*) Tornadoes are most frequent with an increasing storm that moves to the left of its normal path with a pressure trough extending well southward. (See map of Apr. 29, 1909.)

(*b*) When the southern end of a pressure trough swings eastward faster than the northern end, there is great probability that a secondary will develop south or southeast of the northern center. (See maps of Dec. 24, (p. m), 1902, Nov. 8, 1913, and Dec. 8 (p. m.), 1903.

(*c*) There seems to be a tendency for secondaries to form to the leeward of the Appalachian Mountains following the passage eastward of indifferently developed disturbances from the northwest. A pressure-rise coming from the Lake Region and the upper Mississippi Valley seems to play an important part in this phenomenon. When the pressure-rise swings under the low, secondaries do not develop. Secondaries develop with a high moving eastnortheastward from the middle Mississippi Valley (See maps of Jan. 11, 1901, and Jan. 17, 1901.)

Recurving storms.—Storms that start in the northwest and move southeastward do not gather great intensity until they begin to recurve northward. At the time of recurve they move slowly, as a rule, and therefore care must be exercised in predicting clearing weather. The farther south these storms go the sharper will be the recurve and in this case the movement is very slow at at the point of recurve.

This recurving is best developed in the *West Indian hurricanes*. They become very destructive in the region of the recurve. The United States daily weather maps for December 11, 1904, and December 27, 1904, illustrate the type.

The following are considered the most important rules for the guidance of the forecaster in determining the course of a hurricane:

(*a*) A hurricane does not move directly toward a region of high pressure when such an area is not moving perceptibly, but follows in behind it. If the high moves east or northeast off to sea at a normal rate of progression opening a trough after it, the hurricane moves north or northeast in a normal path. If the high hangs persistently over the eastern coast of the United States, the hurricane is deflected far to the west before it can recurve.

(*b*) If rain falls freely before the hurricane comes to land, it is likely to die out; if the downpour begins after reaching land, it is probable that a long vigorous march is yet before it.

(*c*) When a West Indian hurricane is moving westward in the longitude of eastern Cuba and is north of that island, it will recurve east of the south Atlantic coast of the United States, when an area of high pressure covers the Northwestern States. If the hurricane is moving

westward over Cuba or the western Caribbean Sea, when a low area occupies the northwest and the pressure is high in the Eastern States, it will probably move to the Gulf of Mexico and reach the Gulf coast after recurving.

(*d*) "It may be assumed that with a nearly normal distribution and movement of atmospheric pressure areas over the United States, hurricanes will recurve near longitude 80° W. and between latitudes 25° and 28° N. When a hurricane is central east of Cuba and an area of high pressure is advancing eastward over the Gulf and South Atlantic States, the hurricane will probably recurve east of the Bahamas. When the hurricane reaches central Cuba or longitude 80° W. and an area of high pressure is over the West Gulf and Southwestern States, the hurricane will probably recurve over Florida or the east Gulf. When the hurricane reaches the seventy-fifth meridian and an area of high pressure is overspreading the interior and eastern districts of the United States with stationary or falling barometer over the West Gulf and Southwestern States, it will probably advance westward over the Gulf of Mexico. When a hurricane is moving northwestward toward the south Atlantic or middle Atlantic coasts of the United States and the pressure is abnormally high over the Northeastern States and the Canadian Maritime Provinces, the chances are that the storm will not recurve, but will be crowded in upon the coast and develop destructive energy."—(*Garriott.*)

Storm movement.—(*a*) Lows frequently remain stationary over the Great Lakes during the time that the air from an extensive high-pressure area is draining southeastward from the Missouri Valley.

(*b*) As a rule, when the pressure is high north and northeast of a storm it will remain stationary or move very slowly and will be a good rain producer. (See map of Dec. 12, 1904.)

(*c*) With a low supported between two highs, one in the west and the other in the east, it will move rapidly to the northeast, provided its center is north of a line drawn through the centers of the highs. Should the storm center lie south of this line, it frequently happens that the western high moves eastward and the low is penned in. In this case it may remain stationary several days. (See maps of May and June, 1903.) The former movement may be accomplished with the rain area running well to the northward. In the latter case it will remain close to the storm center.

(*d*) When a low forms on the western periphery of an area of high pressure that is sluggish, it will move rapidly north-northeastward and the precipitation area will extend but a short distance east of the track of its center.

(*e*) The movement of a storm directly northward is unusual and seldom occurs except when the pressure is abnormally high east and northeast of its center and is increasing. This movement is attended by a marked increase in the storm's intensity and the rain area runs far to the northward.

(*f*) The suppression of a low takes place when an area of high pressure of great magnitude forces the low southward or southeastward and then moves eastward in front of the low. Not infrequently this movement completely fills up the low. At times, however, the low gives evidences of renewed life. There are more or less general rains south and southwest of the high and cloudiness that extends well up to the center of the high. In this case a widespread rain area follows the eastward movement of the high.

(*g*) Factors to be considered in determining a storm's movement:

1. What are the regions that are supplying the streams of air that feed the storm? Are these streams directly opposing each other? If so, a widespread rain area results. Or do they meet at an obtuse angle (that is, the one from southerly latitudes is flowing northeast and the one from the northwest is flowing southeast)? If so, the area of rain is limited and confined largely to the north. These stream lines must be carefully studied. Consider their extent, their force, the duration of flow, the temperature involved, etc. Their dissipation is a thing to be carefully considered. For instance, a stream of cold air from the northwest may be considered to be losing intensity when the pressure begins to fall in the northwest, especially when the fall starts in at the crest of the high in that region.

2. The centrifugal force of the winds flowing around a low seems to be the primary cause of baric gradients within the region of cyclonic circulation. Therefore, any wind out of proportion to the gradient during the process of development is strongly indicative of an increase in the storm's intensity.

3. Marked changes in temperature in the southeast and northwest quadrants imply an increase in the storm's intensity. Small temperature changes do not indicate a further development of the storm.

4. Abnormally high temperatures northwest of a storm indicate that the storm will either retrograde or remain stationary.

5. The position of the maximum 12-hour pressure fall is strongly indicative of future developments. Pressure-fall in the rear indicates slow clearing and slow movement of the storm. When the pressure-fall is great and the center of greatest fall is near the storm center, a rapid increase in intensity may be looked for. When the fall extends far in advance of the storm center the movement will be slow.

6. The trend of the isotherms is indicative of the storm's movement when the horizontal temperature gradient is marked.

7. Storms with circular isobars and small centers (that is, inner isobar small) usually move slowly and toward the northeast despite what the pressure distribution indicates. This has no reference to West Indian hurricanes nor to storms of the Pacific coast. (See maps of Dec. 29, 1906; Jan. 21 (p. m.), 1902; and Dec. 25 (p. m.), 1913.)

8. Storms that have steep barometric gradients on their western sides and not on the eastern are invariably slow movers if pressure at the centers is decidedly low.

9. Lows moving south of east move rapidly. (See maps of Jan. 6 and 7, 1903.) The slowest moving lows are those that have a tendency to move directly northward. (See maps of Jan. 3, 1906, and Dec. 25 (p. m.), 1913.)

10. Steep but irregular barometric gradients will shortly be followed by the storm taking on a circular form. (See maps of Dec. 4, 1902; Dec. 8, 1907; Jan. 20 (p. m.), 1902; Jan. 21, 1904; Jan. 25, 1904; and Jan. 10. 1908.)

11. Storms with isobars closely crowded on the west and northwest sides generally move slowly and to the east or southeast, and the precipitation and high winds are maintained unusually long in the northern and western quadrants. (See maps of Dec. 15, 1907, and Dec. 3, 1902.)

12. When there is an area of indifferent pressure gradient between two areas of high pressure, a storm will develop in this region. If the inner closed isobar is of considerable initial diameter, the disturbance will increase rapidly. If the inner closed isobar is small the storm is not likely to gain intensity. For storms having initial inner isobars of large diameter, see maps of November 3, 1904, November 12, 1904; January 15, 1902; and January 12, 1904.

13. Storms with isobars closely crowded in the south and southeast quadrants move rapidly northeastward and the weather quickly clears after the passage of the storm center. Another type of fast moving storm has the isobars close together immediately east of the storm center—it gathers marked intensity as it moves rapidly eastward. In this case the difference in pressure east and west of the storm is about the same but the pressure gradient adjacent to the storm center is much steeper on the east than on the west of it. (See map of Dec. 2, 1902.)

14. It is common to speak of two storms having united or coalesced. This is a rare occurrence—probably it never occurs. When two storms appear on a map with a narrow belt of high pressure separating them, they usually travel as individual storms. At other times one of the storms gains in intensity while the other loses intensity and finally disappears. More frequently in cases where there are two storms, one in the north and the other in the south, connected by a trough of relatively low pressure, the southern storm develops rapidly in intensity at the expense of the northern storm, which finally disappears. Storms lying due east and west of each other usually retain their individuality and travel eastward without material change in intensity.

HIGHS.

"Pivoted" highs.—A high around which the isobars are elliptical and whose major axis assumes various positions may be designated a "pivoted high.") Such highs are frequently seen on the weather map, and the shifting of its major axis is often indicative of weather conditions for several days in advance. For instance, if the northern end of the major axis of a high is pivoted in the Northwestern States while the southern end is swinging rapidly eastward, rain or snow with slowly rising temperature follows in the middle Mississippi Valley and the Southwest. (See maps of Jan. 10, 1908, and Dec. 10 (p. m.), 1909.) If, however, the southern end of the major axis of a high remains fixed in position while its northern end is moving eastward, fair weather follows for several days.

Large highs.—An infrequent pressure distribution shows relatively high pressure covering the interior of the United States with minor lows over the plateau and along the northern border. When this condition obtains it is persistent, and as a rule the crest of the high drifts slowly southward especially when the isobars trend due east and west over the southern quadrants. In such cases rain falls on the southern periphery of the high and advances southward with the high. The breaking of this pressure condition begins with the appearance of an extensive fall in pressure in the Northwest with an extension southward to Texas, where rains may already have begun. Frequently a widespread rain area follows although the map may appear to indicate fair weather. (See maps of Jan. 1, 1904; Nov. 9–12, 1905; Nov. 30, 1902; Dec. 14, 1903; Dec. 3–4, 1904; Jan. 1–5, 1901, and Jan. 4–7, 1902.)

Circular highs.—Areas of high pressure around which the isobars are circular or nearly so are usually followed by rain or snow. They move rapidly and usually toward the northeast or east. They appear to have little power to bring colder weather except to the regions immediately in front of them. As they pass over any given locality the winds shift quickly to east and rain sets in with rising temperature (this applies to the great central valleys and the Eastern and Southern States). Highs of a circular form move at about the same rate as a cyclone under similar conditions would move. They in almost all cases move to the east or northeast to the St. Lawrence Valley. Unless exceptional, neither frost nor cold waves should be forecast for localities south of its front. A number of examples of this type have been noticed and all have acted in this manner. (See maps of Dec. 23, 1903, Dec. 30, 1905, and Dec. 21, 1907.)

Lake region highs.—In the spring there are frequent instances where highs develop north of the Great Lakes and remain stationary for 36 to 48 hours or even longer. This is a fair-weather type for the Lakes and the New England and Middle Atlantic States, except that as the high develops southward there is a "squeeze" (a region of opposing winds) that causes rain. If the high increases, this rain area is driven south; if the high drifts eastward, the rain area may remain stationary and prolong the rain with northeast and east winds. The key to the building of this high is the pressure-change map.

Missouri Valley highs.—Highs that come out of the Northwest and remain stationary over the Missouri Valley frequenty diminish in intensity. In such cases it has

been observed that a more or less marked rise in pressure over the region north of Minnesota and the Dakotas is a sure indication that another high of marked intensity is moving southward from that region and that the cold wave attending it will sweep rapidly southward and eastward. This seems to be the invariable sequence, and, if not promptly announced, the cold wave will pass without warning. (See map of Jan. 23, 1902.)

Winter Plateau highs.—These highs remain stationary and offshoots move out of them eastward. An almost certain index to the disintegration of the Plateau high may be gained from the temperature conditions prevailing within its area. Rising temperature always precedes and attends the breaking up of this high. (See map of Dec. 9, 1913.)

Highs over the Western Plateau are coincident with fair weather except in the Lake Region, the upper Ohio Valley, and the north Atlantic States, where there is precipitation due to a succession of lows from the Northwest. The latter statement does not hold good when the pressure is abnormally low over the North Pacific and high over the Atlantic. In this case all northern lows are followed by developments in the South or Southwest. (See maps of Jan., 1910.)

The saddle.—The saddle (two adjacent but connected highs) is always attended by a slow movement of the area of low pressure south of it, which under this condition is a good rain producer. (See maps of Nov. 28, 1905, Dec. 1, 1904, Jan. 22 (p. m.), 1904, and Jan. 10, 1904.)

At times the southern low breaks through the "saddle" and moves northward. This happens when the eastern high moves eastward and an abnormal pressure fall is shown directly north of the storm center. (See maps of Dec. 8 (p. m.), 1907, Nov. 5, 1905, and Dec. 4, 1904.)

At other times it has been observed that with the highs increasing the storm is forced southward and dissipated. (See map of Nov. 9, 1905.) A saddle that holds a storm stationary or nearly so is frequently found on the weather map.

Invert the saddle, and the type becomes that of a fast moving storm. (See map of Jan. 2, 1902.)

SELECTED BIBLIOGRAPHY.

There is much that has been written on weather forecasting that should be read by beginners in this interesting field of meteorology. A study of the following works is considered essential to a proper understanding of the subject:

Short memoirs on meteorological subjects. Translated by Cleveland Abbe. Annual report, Smithsonian Institution, 1877. Washington, 1878. pp. 376–478. 8°. (Also reprinted, Washington, 1878.)

Aids to the study and forecast of weather. By W. Clement Ley. London, 1880. 38 p. 8°.

Weather. A popular exposition of weather changes from day to day. By Ralph Abercromby. London, 1887. xix, 472 p. 12°.

Preparatory studies for deductive methods in storm and weather predictions. By Cleveland Abbe. Washington, 1890. 165 p. 8°. (Ann. rpt. Chief Sig. Off., 1889; App. 15.)

Mechanics of the earth's atmosphere. A [2d] collection of translations. By Cleveland Abbe. Washington, 1891. 324 p. 8°. (Smithsonian misc. coll., No. 843.) [Reprinted, Washington, 1893.]

Meteorology, weather and methods of forecasting. By Thomas Russell. *1st edition.* New York, 1895. xxiii, 277 p. 22 pl. 8°. [Particularly chapter 8, wherein is described the construction and use of the 22 plates of charts showing pressure-types with subsequent rainfalls. The original 284 charts from which the above 22 plates were selected are still preserved in the Weather Bureau library. These valuable charts have been omitted from the "2d edition" of Russell's work.]

Pressure and rainfall charts. By Thomas Russell. 284 Ms. charts prepared previous to 1893. [See his "Meteorology".]

Studies of weather types and storms. By professors and forecast officials of the Weather Bureau, Part 2. Washington, 1896. var. pag. 4°. (U. S. Weather Bureau publication No. 92.)

Atmospheric circulation in tropical cyclones, as shown by the movement of the clouds. By H. B. Boyer. Washington, 1896. 17 p. 8°. (U. S. Weather Bureau publication.)

Storms, storm tracks, and weather forecasting. By Frank H. Bigelow. Washington, 1897. 87 p. 8°. (U. S. Weather Bureau Bull. 20. W. B. publication No. 114.)

West India hurricanes. By Benito Viñes. Washington, 1898. 34 p. 8°. (Part of Weather Bureau Bull. No. 11. Special publication. W. B. publication No. 168.)

Report on the international cloud observations. By Frank H. Bigelow. Washington, 1900. 787 p. 4°. (Report, Chief of U. S. Weather Bureau for 1898–99. v. 2.)

West Indian hurricanes. By Edward B. Garriott. Washington, 1900. iv, 69 p. 4°. (U. S. Weather Bureau Bull. H. W. B. publication No. 232.)

Report on the barometry of the United States, Canada, and the West Indies. By Frank H. Bigelow. Washington, 1902. 1005 p. 4°. (Report, Chief of U. S. Weather Bureau, 1900–01, v. 2.)

Storms of the Great Lakes. By Edward B. Garriott. Washington, 1903. 9 p., 968 chts. 4°. (U. S. Weather Bureau Bull. K; W. B. publication No. 288.)

Weather folk lore and local weather signs. By Edward B. Garriott. Washington, 1903. 153 p. 8°. (U. S. Weather Bureau Bull. 23; W. B. publication No. 294.)

Long-range weather forecasts. By Edward B. Garriott. Washington, 1904. 68 p. 8°. (U. S. Weather Bureau Bull. 35; W. B. publication No. 322.)

A popular treatise on the winds. By William Ferrel. New York, 1889. vii, 505 p. 8°.

Cold waves and frosts in the United States. By Edward B. Garriott. Washington, 1906. 22 p. 328 chts. 4°. (U. S. Weather Bureau Bull. P; W. B. publication No. 355.)

Relation between storm movement and pressure distribution. By Edward H. Bowie. *In* Monthly weath. rev., Washington, Feb., 1906, **34:** 61–64.

Mechanics of the earth's atmosphere. A collection of translations by Cleveland Abbe. Third collection. Washington, 1910. iv, 617 p. 8°. (Smithson. miscel. coll., v. 51, no. 4. [Publication no. 1869])

Forecasting weather. By W. N. Shaw. London, 1911. xxvii, 380 p. 8°.

Meteorology. By W. Isbister Milham. New York, 1912. xvi, 549 p. 8°.

Hurricanes of the West Indies. By Oliver L. Fassig. Washington, 1913. 28 p. 25 pl. 4°. (U. S. Weather Bureau Bull. X; W. B. publication No. 487.)

TABLE 3.—*Number, direction, and speed of movement of January storms*

Longitudes west of Greenwich.	130–125			125–120			120–115			115–110			110–105			105–100			100–95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:				7	102	843	23	97	737	47	105	780	39	109	775	35	106	760	28	104	811
55–50										11	106	727	9	114	856	18	106	720	27	98	704
50–45													4	91	812	7	91	714	15	96	735
45–40																2	87	825	6	80	608
40–35																			1	72	850
30–25																					
North Pacific:	3	80	1083	6	80	850	12	90	848	15	89	680	13	101	885	10	102	805	6	97	700
55–50	35	68	623	35	86	785	16	103	903	10	89	800	5	90	1050	8	105	935	6	105	633
50–45	4	70	300	9	61	661	7	93	893	8	113	734	9	110	711	8	70	981	4	70	912
45–40				1	102	800	1	102	800	2	102	562	5	98	800	10	106	692	2	58	950
40–35										1	90	550				4	86	837	3	66	1033
35–30																					
South Pacific:																			1	84	850
50–45				2	91	780				2	114	425	1	90	800	3	78	717	2	70	725
45–40				3	89	683	7	98	564	10	91	575	7	51	480	4	88	700	4	96	700
40–35				2	42	500	6	91	575	17	84	768	4	90	637	10	80	730	8	41	906
35–30																1	27	700	9	55	661
30–25																					
Northern Rocky Mountain:							1	145	600	2	120	725	3	116	800				1	70	600
50–45										1	137	600	7	119	671	3	106	492	3	90	767
45–40													1	105	600	3	121	667	1	3	650
40–35																1	148	400	2	128	488
35–30																			3	47	817
30–25																					
Colorado:																					
50–45										2	99	850	5	83	790	8	110	681	3	71	833
45–40										6	92	725	2	100	700	24	85	768	9	85	592
40–35										2	106	800	1	81	750	3	96	650	9	68	761
35–30																			3	55	950
30–25																					
Texas:																					
50–45																					
45–40																2	129	625	3	66	816
40–35													3	68	650	9	100	622	15	66	557
35–30																3	54	467	30	64	721
30–25																					
East Gulf:																					
45–40																					
40–35																					
35–30																					
30–25																					
South Atlantic:																					
50–45																					
45–40																					
40–35																					
35–30																					
30–25																					
25–20																					
Central:																			1	103	450
50–45																					
45–40																			1	94	700
40–35																			1	72	1050
35–30																					
30–25																					

for each 5-degree square of the United States, classified by regions of origin.

Longitudes west of Greenwich.	95-90			90-85			85-80			80-75			75-70			70-65			65-60			60-55		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta.																								
55-50.	7	106	743	6	104	717	3	119	933										1	79	700			
50-45.	25	96	684	38	98	711	34	93	782	27	89	713	17	86	625	10	88	650	2	208	400			
45-40.	14	71	693	12	69	931	13	69	781	11	74	650	8	50	544	8	51	544	4	60	500			
40-35.	5	73	860	3	78	833	2	56	725	1	51	900	1	51	900									
30-25.																								
North Pacific.																								
55-50.				2	134	475																		
50-45.	7	96	814	11	92	773	14	96	711	10	85	738	5	83	700							3	13	370
45-40.	6	103	704	5	74	785	9	84	778	5	81	750	2	47	750	3	45	450						
40-35.	7	61	836	3	69	817	1	58	500	1	33	300	1	49	500									
35-30.	4	87	612	2	84	550	1	173	200	2	175	225												
South Pacific.																								
50-45.				1	81	850				1	81	750	1	87	700	1	87	700						
45-40.	2	70	1075	3	66	983	4	62	937				2	54	950	2	48	800	2	40	825			
40-35.	4	56	725	3	55	816	1	68	1100				2	46	950	2	40	850	1	29	1050			
35-30.	3	55	833	6	58	1042	1	75	950	1	50	900	1	50	900									
30-25.	3	64	883	1	62	1200																		
Northern Rocky Mountain.																								
50-45.	1	87	650	1	90	750	1	90	750	2	82	1200												
45-40.	2	71	500	2	58	750	2	60	600	1	60	850												
40-35.	2	64	675																					
35-30.				1	38	1300																		
30-25.				1	105	600																		
Colorado.																								
50-45.				2	85	550	4	81	662	1	90	650	1	54	500									
45-40.	8	66	770	9	70	800	9	70	803	7	52	632				1	50	350						
40-35.	5	66	845	6	56	779	3	63	733	4	12	556	1	35	725									
35-30.	11	58	810	4	45	800	2	40	738	1	36	775												
30-25	1	78	950																					
Texas.																								
50-45.				2	66	750	2	64	650	2	125	675	1	50	450	2	72	500	1	53	750			
45-40.	3	52	850	2	96	1000	7	56	836	5	66	980	6	44	660	3	42	550	3	32	500			
40-35.	9	47	772	11	50	855	11	49	1014	7	34	830	2	42	650									
35-30.	20	42	750	13	52	900	7	32	664	6	31	942	2	38	525									
30-25.	13	60	696	12	57	830	4	57	662															
East Gulf.																								
45-40.										1	62	1000	1	54	600	2	60	750	1	74	450			
40-35.							1	41	850	3	41	816	5	45	780	2	46	975						
35-30.				3	42	783	1	33	750	5	32	830	1	32	700									
30-25.				2	44	875	7	46	714	1	57	550												
South Atlantic.																								
50-45.																								
45-40.													2	54	950	3	47	950	1	32	950			
40-35.										2	50	825	6	44	783	2	42	750						
35-30.										5	35	500	3	40	767									
30-25.							1	63	1000	3	38	733												
25-20.										1	43	700	1	23	850									
Central.																								
50-45.	2	122	450	2	78	750	1	72	1000	1	65	1100				1	23	400						
45-40.				2	45	675	3	51	1067	2	59	1050	1	15	450	2	10	425						
40-35.	3	68	1000	2	56	550	2	43	1000	2	38	600	1	32	700									
35-30.	1	72	1050	1	55	1350																		
30-25.																								

TABLE 4.—*Number, direction, and speed of movement of February storms*

Longitudes west of Greenwich.	130-125			125-120			120-115			115-110			110-105			105-100			100-95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55-50				10	111	890	19	91	618	39	107	776	25	114	732	24	117	735	18	108	675
50-45										3	146	1100	10	122	710	8	120	644	14	106	732
45-40													3	133	850	3	136	750	13	93	581
40-35																6	95	442	9	101	489
35-30																3	66	367	4	89	525
30-25																					
North Pacific:																					
55-50	6	88	700	7	100	921	9	104	744	13	107	592	13	100	770	8	106	706	3	106	933
50-45	23	87	843	29	99	602	5	117	640	10	121	780	7	120	830	4	107	838	9	86	706
45-40	4	110	638	12	112	446	7	120	821	10	112	850	16	120	791	7	92	686	5	65	910
40-35				4	121	438	10	121	440	10	81	505	9	92	678	17	96	624	14	78	618
35-30				2	86	325	3	66	320				5	72	900	4	112	562	7	78	736
30-25																3	64	1130	3	79	817
South Pacific:																					
50-45																					
45-40				2	3	400	3	88	433	2	114	350				2	138	500			
40-35				3	64	483	6	91	600	12	88	583	6	79	800	6	71	875	6	57	992
35-30							4	63	500	21	88	714	10	91	645	8	98	625	5	73	780
30-25																1	57	550	10	52	930
Northern Rocky Mountain:																					
50-45										1	91	1000									
45-40										1	150	850				5	121	660	3	103	767
40-35													1	151	400	1	101	550	3	85	783
35-30													1	130	400	2	87	675	1	56	800
30-25																1	75	700	1	100	1000
Colorado:																					
50-45																					
45-40										1	75	1200	2	89	950	2	83	1050	1	96	1000
40-35										7	129	429	10	126	650	21	96	702	16	70	712
35-30													2	88	675	4	74	650	10	75	665
30-25																			3	54	900
Texas:																					
50-45																					
45-40																			1	66	800
40-35																1	88	950	2	46	775
35-30													4	88	638	7	86	680	10	62	790
30-25																3	77	700	22	57	648
East Gulf:																					
45-40																					
40-35																					
35-30																					
30-25																					
South Atlantic:																					
50-45																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
Central:																					
50-45																					
45-40																					
40-35																			1	124	500
35-30																					
30-25																					

for each 5-degree square of the United States, classified by regions of origin.

Longitudes west of Greenwich.	95–90			90–85			85–80			80–75		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta.												
55–50.	6	105	602	6	112	858						
50–45.	19	98	663	28	94	623	21	84	695	15	80	650
45–40.	7	85	693	10	82	680	10	80	715	7	73	743
40–35.	6	68	783	4	68	837	4	54	600	2	48	550
35–30.	5	87	450	2	55	775	3	43	633			
30–25.	3	74	433	2	70	375	1	42	600			
North Pacific.												
55–50.	1	100	450	1	102	550	1	86	1,150			
50–45.	6	82	733	9	90	590	5	88	590	4	87	725
45–40.	7	73	836	8	61	888	6	74	983	4	68	700
40–35.	8	51	794	8	63	744	4	56	688	2	46	575
35–30.	4	60	688	2	69	975	1	54	1,250			
30–25.	5	71	980									
South Pacific.												
50–45.				1	90	750	2	84	750	1	76	900
45–40.	2	60	950	5	69	760	5	76	900	4	82	625
40–35.	3	54	900	8	70	806	2	64	1,050	4	62	475
35–30.	7	55	786	6	61	883	2	54	700			
30–25.	2	52	825	1	47	850						
Northern Rocky Mountain.												
50–45.	1	67	1,050	1	119	700	1	66	1,000	1	72	700
45–40.	1	67	1,050	1	66	1,000	1	72	700			
40–35.	1	60	500	2	73	875						
35–30.												
30–25.												
Colorado.												
50–45.										2	74	950
45–40.				7	67	800	8	100	588	7	70	707
40–35.	13	62	788	11	69	809	7	81	650	8	48	656
35–30.	8	61	900	3	59	583	2	40	950	2	36	700
30–25.	1	66	900	1	66	900						
Texas.												
50–45.							1	93	900	1	69	550
45–40.	2	51	725	3	48	700	7	43	662	8	62	700
40–35.	2	41	975	8	42	738	4	77	687	5	65	900
35–30.	17	55	803	18	58	820	5	47	680	7	38	707
30–25.	17	66	471	7	67	557	4	78	412	1	20	1,050
East Gulf.												
45–40.												
40–35.										2	46	1,000
35–30.				2	72	600	5	55	540	5	34	760
30–25.				5	42	550	4	32	738	1	32	600
South Atlantic.												
50–45.												
45–40.												
40–35.										2	43	900
35–30.												
30–25.										2	50	425
25–20.										1	35	400
Central.												
50–45.				1	80	700	1	88	750			
45–40.	4	77	750	3	78	1,000				2	76	600
40–35.	2	103	825				1	56	1,300			
35–30.	1	121	650	1	116	650						
30–25.							1	73	1,150			

Longitudes west of Greenwich.	75–70			70–65			65–60			60–55		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta.												
55–50.	1	99	700									
50–45.	8	86	538	7	92	500	1	85	550	2	58	425
45–40.	6	51	600	4	41	488	1	52	250			
40–35.	2	37	725									
35–30.												
30–25.												
North Pacific.												
55–50.												
50–45.	1	82	600							1	−5	250
45–40.	4	78	475	2	79	425	1	17	350			
40–35.	1	41	950									
35–30.												
30–25.												
South Pacific.												
50–45.	1	47	400	1	106	400						
45–40.	6	51	525	5	51	460	1	16	250			
40–35.	2	64	475									
35–30.												
30–25.												
Northern Rocky Mountain.												
50–45.												
45–40.												
40–35.												
35–30.												
30–25.												
Colorado.												
50–45.	2	86	525									
45–40.	8	46	550	1	50	500	1	65	600			
40–35.	3	35	533									
35–30.												
30–25.												
Texas.												
50–45.	1	108	650									
45–40.	4	42	775	3	36	700	1	75	500			
40–35.	6	37	760	2	53	775						
35–30.	3	70	600									
30–25.												
East Gulf.												
45–40.				1	75	550	1	65	600			
40–35.	3	48	800									
35–30.	1	32	600									
30–25.												
South Atlantic.												
50–45.							1	87	700			
45–40.	3	54	683	1	48	400						
40–35.	2	40	650									
35–30.	4	31	375									
30–25.												
25–20.												
Central.												
50–45.				1	45	500						
45–40.	1	51	550	3	58	583	2	60	400			
40–35.												
35–30.												
30–25.												

TABLE 5.—*Number, direction, and speed of movement of March storms for*

Longitudes west of Greenwich.	130-125			125-120			120-115			115-110			110-105			105-100			100-95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55-50				17	112	647	23	99	594	46	109	576	29	114	772	20	110	808	21	107	815
50-45	1	165	500	7	131	436	2	122	850	4	146	750	16	127	672	13	116	585	20	85	645
45-40				1	75	700	1	100	900	4	132	400	8	98	656	11	87	536	16	68	669
40-35										2	124	350	3	104	467	11	87	445	8	51	519
35-30																3	63	617			
North Pacific:																					
55-50				6	84	592	8	74	506	13	121	604	8	110	712	2	128	650	3	112	900
50-45	18	91	672	26	85	787	8	86	569	11	112	760	10	101	780	3	113	983	6	92	942
45-40	7	66	479	9	121	600	9	118	611	8	106	694	6	92	667	13	89	673	9	88	533
40-35				2	66	750	1	97	750	5	93	710	11	107	510	8	82	600	15	78	580
35-30																4	107	700	6	96	742
30-25																1	95	650	4	51	912
South Pacific:																					
55-50																					
50-45													1	160	800				1	84	800
45-40	1	74	850	2	45	775	4	93	562	3	104	683	3	97	650	4	92	612	2	56	700
40-35				6	54	610	12	54	430	12	88	500	12	154	404	9	80	700	7	58	621
35-30				2	5	825	2	66	875	15	71	640	9	84	660	6	80	533	6	60	792
30-25																			6	71	500
Northern Rocky Mountain:																					
50-45													2	118	825						
45-40													4	128	488	2	94	575	4	86	637
40-35										1	81	550	1	88	1000	3	111	750	1	72	650
35-30																					
30-25																					
Colorado:																					
55-50																					
50-45													2	124	875	1	126	650	2	24	325
45-40				1	115	450	2	160	275	4	128	587	3	109	300	4	60	625	4	42	466
40-35										7	109	543	18	112	570	32	95	583	23	85	740
35-30										4	89	487	4	77	712	7	91	486	8	85	625
30-25																1	62	1200	5	81	790
Texas:																					
50-45																					
45-40																					
40-35																1	140	200	2	62	800
35-30													2	83	675	5	61	600	16	55	697
30-25																1	70	400	18	53	711
East Gulf:																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
South Atlantic:																					
55-50																					
50-45																					
45-40																					
40-35																					
35-30																					
Central:																					
50-45																1	116	1350			
45-40																1	115	800	2	69	650
40-35																			4	94	725
35-30																					

each 5-degree square of the United States, classified by regions of origin.

95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
4	113	540	6	93	850																			55–50.
19	88	645	25	84	784	17	80	688	18	82	706	8	81	606	5	86	550							50–45.
19	84	708	10	73	820	15	74	760	6	67	725	8	54	550	5	59	400							45–40.
4	72	850	4	101	662	2	50	600	3	36	817	2	36	775	1	57	650							40–35.
1	50	900	2	70	625	3	81	500	1	30	800													35–30.
																								North Pacific.
1	89	900																						55–50.
4	88	1012	6	93	825	3	76	817	2	82	750	1	75	500	2	96	550	1	75	750				50–45.
12	78	704	9	78	956	9	83	678	4	63	625	3	58	633	2	54	625							45–40.
7	60	807	5	69	610	1	70	750	1	30	400	2	23	650										40–35.
1	46	800				2	52	725	1	27	950													35–30.
2	72	600	1	55	700																			30–25.
																								South Pacific.
1	103	1050																						55–50.
1	82	500				4	89	675	1	81	850	2	78	775	1	86	550							50–45.
4	61	738	3	56	700	5	66	840	1	80	450	3	39	716										45–40.
4	89	750	5	53	980	2	62	675	3	47	650	2	40	300										40–35.
7	64	664	2	54	825	2	42	1050	1	34	500													35–30.
3	47	800																						30–25.
																								Northern Rocky Mountain.
									1	66	450													50–45.
3	67	800	2	52	625	1	58	1150																45–40.
1	57	1600																						40–35.
																								35–30.
																								30–25.
																								Colorado.
			1	86	750																			55–50.
2	68	425				4	79	937	2	86	825	2	74	750										50–45.
10	71	720	5	76	760	7	61	964	3	55	850	2	22	575	1	43	1200							45–40.
14	65	861	9	63	944	1	57	650	3	27	716	2	40	1000	2	42	925							40–35.
3	52	1116	4	70	987				1	40	1050	1	50	600										35–30.
1	68	650																						30–25.
																								Texas.
						2	90	650	3	86	813	1	65	400	3	77	450	1	62	400				50–45.
			3	55	900	3	57	767	4	60	688	3	35	567	3	28	516							45–40.
4	40	962	6	49	1025	5	59	880	2	42	575	4	40	862	2	42	925	1	35	1400				40–35.
14	51	725	10	58	710	5	38	850	2	42	875	2	50	925										35–30.
5	59	790	2	62	750	2	44	725																30–25.
																								East Gulf.
												2	54	500										45–40.
						1	110	450	1	60	250	3	45	633										40–35.
			4	69	812	5	38	670	2	38	775													35–30.
			1	85	350	4	37	683																30–25.
						1	3	400																25–20.
																								South Atlantic.
																		1	70	600				55–50.
												1	42	550	4	90	425							50–45.
												4	34	625	1	70	700							45–40.
									5	58	720	3	66	500										40–35.
						1	26	950																35–30.
																								Central.
1	88	800	5	116	560	1	75	350	2	99	550	1	92	700										50–45.
4	103	738	2	70	750	5	71	920	2	84	800	2	59	900							1	45	700	45–40.
3	60	850	3	87	667	6	97	433	2	60	750	2	64	750										40–35.
									1	22	650													35–30.

TABLE 6.—*Number, direction, and speed of movement of April storms*

Longitudes west of Greenwich.	130–125			125–120			120–115			115–110			110–105			105–100			100–95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55–50				14	95	646	28	115	507	46	106	573	34	125	559	27	117	634	17	109	785
50–45				1	87	600	8	128	612	8	100	564	19	116	503	23	119	530	25	104	460
45–40							1	70	300	1	112	450	8	126	420	14	111	400	18	89	608
40–35							3	65	200	1	140	400	4	156	325	19	105	487	1	74	550
35–30													2	226	175	1	130	300	15	42	550
North Pacific:																					
55–50				3	49	250	10	89	520	14	76	461	8	98	388	5	112	490	5	109	740
50–45	6	63	550	17	87	738	6	65	533	5	91	650	3	99	670	3	127	520	6	92	503
45–40	2	33	525	9	87	711	9	105	600	8	104	500	6	111	450	11	116	505	9	58	328
40–35										5	81	410	11	76	445	17	86	388	14	82	461
35–30													1	30	300	3	100	200	5	114	310
30–25																			3	−8	433
South Pacific:																					
50–45							2	114	450	3	132	517									
45–40				1	106	650	4	108	390	4	78	612	1	50	150	6	62	333	7	55	621
40–35				3	43	450	9	82	506	10	78	690	10	84	660	14	89	525	12	73	520
35–30							2	20	400	11	57	555	4	28	438	3	26	767	4	52	588
30–25																			2	35	400
Northern Rocky Mountain:																					
50–45										5	150	460	3	149	500						
45–40										3	138	533	4	122	638	10	118	460	2	78	800
40–35										1	25	350	2	38	725	6	90	483	7	62	614
35–30																					
30–25																					
Colorado:																					
50–45																			2	72	500
45–40										3	111	450	6	93	350	8	100	225	6	53	410
40–35							1	79	650	12	90	442	20	93	507	22	86	486	20	72	645
35–30										2	10	350	4	−49	262	4	42	550	3	32	1483
30–25																			1	56	000
Texas:																					
50–45																1	70	350	1	4	300
45–40																			1	53	550
40–35													1	22	800	3	25	783	1	108	600
35–30													5	57	470	5	58	800	4	125	488
30–25																3	78	600	11	62	577
25–20																			2	60	400
East Gulf:																					
45–40																					
40–35																					
35–30																					
30–25																					
South Atlantic:																					
50–45																					
45–40																					
40–35																					
35–30																					
30–25																					
25–20																					
Central:																					
50–45																			2	114	575
45–40																			4	68	600
40–35																			3	34	367
35–30																					
30–25																					

for each 5-degree square of the United States, classified by regions of origin.

95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
4	105	812																						55–50.
23	96	552	25	101	680	12	82	658	14	89	680	6	95	560	2	82	575							50–45.
14	74	550	20	83	638	12	78	583	10	97	345	7	68	264	3	48	400							45–40.
6	78	650	7	83	536	5	80	340	5	50	600	3	44	550	1	38	700							40–35.
1	51	750	2	76	350	1	73	450																35–30.
																								North Pacific.
1	91	1000																						55–50.
5	87	500	8	91	638	7	82	850	5	72	590	4	70	500	2	80	500							50–45.
9	51	572	8	50	431	7	81	400	4	97	640	3	57	417	1	52	450	1	57	500				45–40.
4	67	400	2	43	400	4	78	412																40–35.
4	42	885							1	33	500													35–30.
																								30–25.
																								South Pacific.
2	117	225	4	146	500	1	73	850	4	73	612	2	54	625										50–45.
9	71	600	4	63	538	7	82	443	3	197	325	1	10	500										45–40.
6	65	700	3	68	683	3	104	783	2	42	550	1	50	750										40–35.
3	73	800	2	46	900																			35–30.
2	11	500																						30–25.
																								Northern Rocky Mountain.
									1	70	600													50–45.
4	70	700	3	84	650	2	121	475	2	174	325													45–40.
4	54	562	1	25	400				2	124	525													40–35.
1	77	600	1	62	550	1	49	500																35–30.
																								30–25.
																								Colorado.
2	78	625	6	82	475	2	62	325	2	76	725	1	75	300										50–45.
8	60	470	8	80	700	5	116	650	4	50	562	3	26	400	1	70	450							45–40.
8	57	600	5	54	600	5	26	340	4	72	175	3	29	300										40–35.
4	58	650	1	70	500	1	46	800	1	30	750													35–30.
																								30–25.
																								Texas.
1	80	900	1	103	700										2	42	350							50–45.
						1	72	800	2	65	625	3	55	300	1	42	550							45–40.
4	61	975	4	52	700	5	41	800	4	34	462	1	53	700	1	−5	400							40–35.
7	60	630	7	53	614	4	37	775	1	28	1,200													35–30.
8	33	538	3	26	470																			30–25.
1	20	500																						25–20.
																								East Gulf.
												2	18	425										45–40.
						1	90	350	1	47	900	2	35	625										40–35.
			4	71	362	6	69	517	3	32	700													35–30.
			1	60	500	1	85	300	1	70	400													30–25.
																								South Atlantic.
																								50–45.
									1	31	500	7	52	360	4	48	362	1	42	500				45–40.
									4	41	675	4	42	300	1	74	200							40–35.
						1	38	750				1	40	1,300										35–30.
																								30–25.
																								25–20.
																								Central.
3	82	767	4	81	612	6	78	602	1	77	500				1	85	650							50–45.
5	90	650	7	66	486	6	94	608	3	101	650	2	38	675	2	64	475	1	77	550				45–40.
6	89	560	3	114	600				3	94	667	4	32	462										40–35.
						1	45	400	1	30	250	1	30	350										35–30.
																								30–25.

TABLE 7.—*Number, direction, and speed of movement of May storms*

Longitudes west of Greenwich.	130-125			125-120			120-115			115-110			110-105			105-100			100-95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55-50				11	95	560	19	102	500	42	100	447	36	117	513	22	118	600	15	101	673
50-45										9	101	672	13	100	435	16	99	425	14	99	532
45-40										1	90	1,150	4	88	417	14	103	300	12	106	421
40-35													1	70	900	4	102	412	10	86	595
35-30																			4	88	462
30-25																1	52	400	1	32	550
North Pacific:																					
55-50				1	130	300	5	97	470	10	96	430	7	112	386	9	112	390	4	104	475
50-45	6	82	708	10	71	505	15	88	447	9	112	306	6	102	308	5	70	330	2	112	350
45-40				3	119	617	14	85	560	10	90	485	9	99	494	8	56	281	4	47	612
40-35							2	110	350	7	119	486	6	96	567	9	81	428	7	59	536
35-30																3	90	883	3	56	1050
South Pacific:																					
55-50																1	90	200			
50-45																2	73	300			
45-40							2	80	475	6	83	450	9	92	378	6	60	467	10	67	370
40-35							10	59	515	13	78	462	13	83	354	15	72	417	9	60	583
35-30							2	68	175	22	80	386	13	71	423	14	117	414	5	68	630
30-25																			3	42	400
Northern Rocky Mountain:																					
50-45										5	98	460	9	112	428	4	93	488	6	75	442
45-40							2	53	275	8	102	406	5	101	470	7	27	393	5	63	590
40-35							2	70	300	2	38	375	3	203	400	7	65	321	9	97	456
35-30													1	50	450						
30-25																					
Colorado:																					
55-50																			1	105	700
50-45																1	110	500	6	63	533
45-40							1	120	150	6	96	417	8	90	581	5	80	600	15	45	517
40-35										9	71	417	15	83	410	20	57	552	15	58	423
35-30																1	60	500			
30-25																					
Texas:																					
50-45																					
45-40																					
40-35																5	40	450	8	78	381
35-30													6	66	892	1	52	850	2	66	750
30-25																3	75	417	7	61	750
East Gulf:																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
South Atlantic:																					
50-45																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
Central:																					
50-45																1	91	300	6	90	442
45-40																			7	66	607
40-35																			2	68	700
35-30																					
30-25																					

for each 5-degree square of the United States, classified by regions of origin.

95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
4	105	488	2	84	950	1	110	500				1	106	450										55–50.
9	109	440	13	93	604	14	90	582	12	84	475	12	84	446	2	107	250							50–45.
12	88	604	11	53	564	5	60	440	9	83	467	7	44	414	2	59	525							45–40.
4	61	438	3	74	617	2	42	575	2	47	450	1	38	700										40–35.
1	70	500	1	50	650																			35–30.
																								30–25.
																								North Pacific.
2	98	625																						55–50.
2	85	575	10	114	410	3	76	417	4	98	438	1	140	400	2	170	325							50–45.
4	85	362	5	65	330	1	110	400	3	81	700				2	58	550							45–40.
3	71	683	1	98	650	2	64	650																40–35.
																								35–30.
																								South Pacific.
																								55–50.
1	47	350	5	82	720	4	78	712	2	96	470	1	83	450	1	105	500							50–45.
10	67	525	5	85	540	2	54	400	1	69	400	3	63	416										45–40.
3	94	550	2	78	625	2	98	400	1	96	350	2	49	550										40–35.
4	95	638	3	112	450																			35–30.
1	80	300																						30–25.
																								Northern Rocky Mountain.
2	136	350	1	91	650	4	74	800	2	88	575	1	110	450										50–45.
5	80	600	9	78	544	4	91	475	1	176	600	2	58	325	2	85	175							45–40.
3	48	333	2	44	225																			40–35.
																								35–30.
																								30–25.
																								Colorado.
																								55–50.
2	81	525	8	79	720	5	78	700	8	112	462	3	109	700	1	108	450							50–45.
11	52	505	5	74	750	4	112	600	1	52	450	3	82	483	1	−5	400							45–40.
8	37	550	4	64	637	3	83	370	3	66	500	1	40	650										40–35.
																								35–30.
																								30–25.
																								Texas.
			1	133	850	1	75	300				2	72	450	2	108	250							50–45.
2	78	375	5	56	320	1	65	500	2	10	475	3	33	367	2	24	300							45–40.
3	63	600	3	103	300	7	50	531	5	42	580	3	44	383	1	20	400							40–35.
8	58	531	7	67	529	3	64	483	1	55	400													35–40.
3	47	450																						30–25.
																								East Gulf.
									1	23	250													45–40.
									1	19	600													40–35.
			2	66	725	6	42	583	1	27	600													35–30.
			1	15	200	6	45	142	2	54	675													30–25.
						2	48	300																25–20.
																								South Atlantic.
																								50–45.
												1	−35	400	1	10	600	1	38	850				45–40.
									6	44	625	4	24	725										40–35.
									4	21	425													35–30.
									3	−12	250													30–25.
																								25–20.
																								Central.
6	91	508	9	94	606	9	79	628	4	62	438	3	88	567	2	65	225							50–45.
8	71	662	10	67	570	5	70	520	5	94	350	5	43	400	1	33	500							45–40.
3	121	317				1	87	450	1	58	800													40–35.
1	78	350																						35–30.
																								30–25.

TABLE 8.—*Number, direction, and speed of movement of June storms*

Longitudes west of Greenwich.	130–125			125–120			120–115			115–110			110–105			105–100			100–95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55–50				6	85	575	30	89	440	56	100	414	48	110	372	35	122	554	19	105	608
50–45				2	92	700	1	80	350	8	90	520	21	96	400	26	115	481	14	107	530
45–40													3	93	370	11	137	314	11	84	414
40–35													2	90	200	7	91	500	6	70	767
35–30																			3	103	550
30–25																					
North Pacific:																					
55–50							4	88	412	10	83	340	7	120	393	8	118	441	2	110	800
50–45	2	98	525	9	72	533	11	55	386	9	108	290	6	106	350	9	87	300	12	88	546
45–40	1	40	1350	8	54	444	4	61	362	6	67	550	2	80	250	12	42	338	4	87	340
40–35							3	58	600	2	80	525	2	39	500	3	2	300	3	64	216
35–30																					
South Pacific:																					
50–45										1	66	650				3	90	516	2	107	925
45–40										3	56	550	2	132	525	2	132	225	3	35	416
40–35				1	22	700	4	61	414	3	53	400	2	70	325	4	72	575			
35–30										3	28	400	2	38	300				1	30	650
30–25																					
Northern Rocky Mountain:																					
55–50										4	64	640				2	88	425			
50–45										5	64	530	5	80	400	12	102	263	6	82	475
45–40										4	54	450	4	88	463	12	95	525	9	103	300
40–35													2	62	350	3	58	600	2	81	375
35–30																					
Colorado:																					
55–50													1	96	450	1	105	600	1	120	1150
50–45																6	76	442	6	80	442
45–40										5	75	410	5	75	320	13	99	450	11	75	473
40–35										3	80	433	9	51	622	23	82	380	14	101	396
35–30																2	102	600	4	69	687
30–25																					
Texas:																					
50–45																					
45–40																					
40–35													2	93	650				2	17	725
35–30													1	15	300				8	49	750
30–25																			3	36	433
East Gulf:																					
45–40																					
40–35																					
35–30																					
30–25																					
South Atlantic:																					
50–45																					
45–40																					
40–35																					
35–30																					
30–25																					
25–20																					
Central:																					
50–45																1	84	600	1	90	500
45–40																			11	76	364
40–35																			8	83	430
35–30																1	40	600	5	101	370
30–25																					

for each 5-degree square of the United States, classified by regions of origin.

95-90			90-85			85-80			80-75			75-70			70-65			65-60			60-55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
8	104	606	3	113	770	2	110	600																55-50.
16	99	606	24	88	642	16	83	644	12	88	330	17	84	447	7	95	300	2	88	175				50-45.
8	86	500	8	84	508	11	76	541	8	68	420	2	56	550	2	45	700	2	38	550				45-40.
2	84	650	2	58	425	3	30	416																40-35.
1	10	200																						35-30.
3	33	200																						30-25.
																								North Pacific.
																								55-50.
4	74	640	3	101	830	4	88	588	4	85	462	4	84	250	4	98	416	1	90	350				50-45.
2	76	575	3	71	630	2	120	425																45-40.
3	90	333	1	82	700				1	190	300	1	65	300										40-35.
																								35-30.
																								South Pacific.
4	80	600	3	81	600	2	64	650	1	107	450				2	58	300							50-45.
									4	70	400	1	65	550	1	62	800							45-40.
2	67	825							1	39	550													40-35.
																								35-30.
																								30-25.
																								Northern Rocky Mountain.
																								55-50.
7	89	614	6	94	583	4	88	350	4	91	412	4	77	412	1	85	500							50-45.
9	89	628	5	88	630	4	96	400	2	120	375	1	38	400										45-40.
1	35	400				2	102	575	2	120	500	1	58	600										40-35.
						2	170	400																35-30.
																								Colorado.
															1	110	400							55-50.
5	78	850	6	84	808	2	70	300	2	75	700	4	85	287										50-45.
4	66	575	5	59	650	1	72	700	2	81	475	1	52	650										45-40.
2	122	250	6	91	325	3	60	467	4	56	475													40-35.
1	72	600										1	40	450										35-30.
																								30-25.
																								Texas.
2	72	425	1	86	350	1	90	400				1	75	650										50-45.
1	88	500	1	79	750	3	78	633																45-40.
4	53	688	2	66	700	2	64	500				2	45	325										40-35.
3	55	470	4	59	662	2	60	650																35-30.
4	45	340	1	26	600																			30-25.
																								East Gulf.
									6	111	292													45-40.
									1	−5	550	2	52	400	1	50	600							40-35.
1	96	250	2	72	650	3	66	367	4	61	375													35-30.
			1	48	500																			30-25.
																								South Atlantic.
									1	82	450	2	99	150	1	90	150							50-45.
									2	78	475	3	60	383										45-40.
									8	60	356	4	40	550	2	48	550							40-35.
																								35-30.
																								30-25.
																								25-20.
																								Central.
8	96	575	5	94	610	7	78	657	3	63	600	7	100	507	1	107	400							50-45.
12	81	608	5	92	520	10	70	640	1	80	800				1	42	700							45-40.
6	70	608	6	77	460	5	103	520				1	67	300										40-35.
																								35-30.
																								30-25.

Table 9.—*Number, direction, and speed of movement of July storms*

Longitudes west of Greenwich.	130-125			125-120			120-115			115-110			110-105			105-100			100-95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55-50				8	100	594	23	94	500	41	106	507	38	103	529	38	123	580	27	102	495
50-45							7	81	386	12	86	496	25	80	444	25	89	480	28	90	570
45-40										3	74	533	4	85	412	16	108	384	18	107	539
40-35																2	134	350	10	94	500
35-30																					
North Pacific:																					
55-50										6	91	340	4	94	612	1	110	500	2	102	625
50-45							8	100	581	3	102	333	8	92	470	5	109	430	8	116	506
45-40				2	52	650	8	83	431	10	76	570				5	97	630	3	92	483
40-35																1	58	800	2	131	300
35-30																			1	225	350
South Pacific:																					
55-50																			1	100	400
50-45										1	95	250				2	58	325			
45-40										4	84	262	3	89	483	1	15	550	4	30	462
40-35							5	64	440	5	69	690	3	66	450	4	48	637	4	52	900
35-30										3	48	550									
30-25																					
Northern Rocky Mountain:																					
55-50																			2	90	900
50-45										1	110	350	8	79	462	11	80	527	9	74	450
45-40										2	52	500				5	81	530	1	70	450
40-35																1	82	400	1	56	750
35-30																					
Colorado:																					
55-50																2	107	325	3	103	367
50-45																3	39	300	1	−5	450
45-40										6	73	675	4	104	540	7	64	571	7	62	571
40-35										5	80	540	6	89	483	14	66	430	12	51	683
35-30																					
30-25																					
Texas:																					
50-45																					
45-40																					
40-35																1	46	1000	1	51	1550
35-30																			4	60	340
30-25																					
East Gulf:																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
South Atlantic:																					
50-45																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
Central:																					
50-45																			4	73	487
45-40																			4	151	425
40-35																			4	82	425
35-30																			1	112	150
30-25																					

for each 5-degree square of the United States, classified by regions of origin.

95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
20	100	652	14	92	650	3	90	733																55–50.
28	88	629	38	95	584	28	89	621	30	82	505	22	97	464	12	93	300							50–45.
6	82	660	11	79	710	7	71	557	6	90	508	7	61	321	6	57	375							45–40.
2	141	450										2	38	525										40–35.
																								35–30.
																								North Pacific.
3	108	250																						55–50.
1	100	400	9	70	489	4	93	487	2	72	575	3	78	483	2	93	300							50–45.
4	106	475	5	79	640	3	78	467	1	73	950													45–40.
1	210	300																						40–35.
																								35–30.
																								South Pacific.
																								55–50.
1	93	400	1	87	650	1	100	500	2	66	300													50–45.
2	75	575	2	81	625	2	76	625				1	76	700										45–40.
																								40–35.
																								35–30.
																								30–25.
																								Northern Rocky Mountain.
																								55–50.
6	91	717	6	84	733	1	98	300	3	71	600	2	64	450	1	80	400							50–45.
			2	86	600	2	82	550	4	52	340	1	51	500										45–40.
1	66	950																						40–35.
																								35–30.
																								Colorado.
2	95	625	1	84	900																			55–50.
2	79	550	5	84	670	4	80	450	3	73	433	5	78	430	3	98	283							50–45.
11	65	686	5	69	640	7	85	430	4	79	375	7	64	400	4	34	312							45–40.
1	50	700																						40–35.
																								35–30.
																								30–25.
																								Texas.
												1	96	300	2	126	275							50–45.
			1	68	900	2	38	475																45–40.
1	60	550	1	75	500	2	−8	500																40–35.
4	85	312	2	100	400	2	−6	500																35–30.
1	76	350	2	38	450																			30–25.
																								East Gulf.
																								45–40.
																								40–35.
			1	55	100	4	71	187	1	35	100													35–30.
																								30–25.
																								25–20.
																								South Atlantic.
																								50–45.
															1	16	350							45–40.
									1	55	300	3	30	450	1	34	400							40–35.
									5	46	330	1	19	700										35–30.
																								30–25.
																								25–20.
																								Central.
4	78	775	5	90	490	3	90	533	4	92	512	4	90	400										50–45.
5	90	640	7	78	564	2	65	475	3	79	533													45–40.
4	86	325	5	90	488	4	81	312	5	156	340	1	39	850										40–35.
						3	95	216																35–30.
																								30–25.

TABLE 10.—*Number, direction, and speed of movement of August storms*

Longitudes west of Greenwich.	130-125			125-120			120-115			115-110			110-105			105-100			100-95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55-50				14	90	500	27	90	480	40	99	500	42	110	487	47	107	554	31	111	537
50-45							3	81	616	17	109	476	20	107	442	32	102	511	29	111	538
45-40													1	82	350	17	96	459	25	89	532
40-35																2	50	525	5	90	460
35-30																					
North Pacific:																					
55-50							3	77	416	4	88	362	4	103	375	4	95	425	2	108	175
50-45				2	58	700	14	60	443	5	90	540	7	90	486	5	65	440	3	92	583
45-40				1	67	550	4	56	475	1	74	600				3	93	416	5	101	340
40-35																					
35-30																					
South Pacific:																					
55-50							2	64	425	2	106	550				2	96	675	2	91	525
50-45							2	46	475	1	100	500	4	104	488				2	91	525
45-40				4	48	562	2	56	575	5	56	450	2	120	525	2	99	500	4	90	590
40-35				5	26	560	3	26	350	1	16	350	4	72	637	2	70	400	3	69	883
35-30										2	53	450									
Northern Rocky Mountain:																					
55-50																					
50-45							2	100	400	9	105	494	11	98	477	11	112	410	10	75	575
45-40							3	79	400	4	105	438	4	88	487	15	88	493	7	85	521
40-35										1	91	250	4	77	350	4	40	450	1	41	900
35-30																					
Colorado:																					
55-50																					
50-45													6	81	433	3	55	283	4	84	400
45-40							3	77	250	10	66	460	3	91	550	6	83	492	11	78	445
40-35										1	51	1200	3	77	616	15	72	573	12	64	625
35-30																1	58	450			
Texas:																					
50-45																					
45-40																					
40-35																					
35-30																3	82	583	4	68	450
30-25																					
East Gulf:																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
South Atlantic:																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
Central:																					
50-45																			4	105	438
45-40																			8	64	344
40-35																			4	55	712
35-30																					
30-25																					

for each 5-degree square of the United States, classified by regions of origin.

95-90			90-85			85-80			80-75			75-70			70-65			65-60			60-55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
14	108	530	6	118	583	3	84	533																55-50.
24	100	600	39	95	605	31	84	534	30	75	465	24	86	425	9	96	407							50-45.
12	67	425	11	71	486	5	76	440	6	49	400	1	28	300	1	47	200							45-40.
3	93	300	2	121	575	1	76	600																40-35.
1	136	300	1	145	150																			35-30.
																								North Pacific.
2	136	300																						55-50.
4	77	450	3	92	433	3	94	400	3	59	500	1	57	400										50-45.
6	75	617	2	94	500	4	106	475	1	20	350				1	15	350							45-40.
									1	74	300	2	30	375										40-35.
																								35-30.
																								South Pacific.
																								55-50.
1	83	700	6	94	575	3	80	483	1	84	600	3	69	467										50-45.
									2	56	475													45-40.
1	76	750	1	44	1,250	1	103	500																40-35.
																								35-30.
																								Northern Rocky Mountain.
																								55-50.
7	74	564	9	92	622	8	80	575	6	94	475	3	80	433										50-45.
5	68	660				1	77	700	1	62	550	1	58	600										45-40.
1	75	550	1	80	650																			40-35.
																								35-30.
																								Colorado.
																								55-50.
7	81	621	6	90	575	5	78	490	5	64	410	2	83	425	2	90	300							50-45.
10	79	515	9	75	467	6	77	600	3	75	467	1	60	500	1	60	400							45-40.
2	36	500	3	97	400	2	86	425	3	58	433													40-35.
																								35-30.
																								Texas.
																								50-45.
																								45-40.
4	61	425	1	78	850				1	25	950													40-35.
7	51	264	7	33	292	1	29	800																35-30.
2	40	100	3	47	216																			30-25.
																								East Gulf.
												1	28	750										45-40.
												1	16	650										40-35.
									1	11	600													35-30.
						1	41	650	1	16	750													30-25.
																								25-20.
																								South Atlantic.
															1	46	700							45-40.
									2	48	800	1	42	800	1	54	400							40-35.
																								35-30.
																								30-25.
																								25-20.
																								Central.
6	102	417	5	84	520	4	78	512	5	87	340	3	77	450	2	84	400	1	78	350				50-45.
9	60	590	8	75	681	9	81	567	6	91	583	6	84	458	4	37	350							45-40.
4	60	512	2	66	475	1	33	400				2	43	300	1	35	300							40-35.
																								35-30.
																								30-25.

TABLE 11.—*Number, direction, and speed of movement of September storms*

Longitudes west of Greenwich.	130-125			125-120			120-115			115-110			110-105			105-100			100-95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55-50				20	93	612	33	97	526	51	101	538	43	105	535	42	116	596	34	102	712
50-45				1	107	700	2	113	850	8	101	712	20	102	507	27	89	485	32	97	620
45-40										1	75	700	3	107	567	15	69	477	20	73	698
40-35																4	116	400	7	60	607
35-30																			1	136	400
30-25																			1	90	500
North Pacific:																					
55-50				1	82	450	2	70	450	4	99	425	5	107	790	3	94	516	2	105	500
50-45	7	70	507	8	74	625	9	98	600	5	94	440	13	104	500	9	98	333	12	113	630
45-40				5	61	490	9	76	583	10	68	570	2	70	475	10	85	405	12	56	475
40-35							1	106	450	2	82	625	2	70	525	5	101	360	5	80	450
35-30																			1	28	400
South Pacific:																					
55-50																					
50-45							1	160	400												
45-40				1	82	550	8	78	344	8	118	500	4	58	575	5	71	370	5	60	500
40-35				3	58	400	4	50	412	5	71	670	4	69	550	5	60	360	5	93	410
35-30										2	62	700							1	30	400
Northern Rocky Mountain:																					
55-50																					
50-45							2	58	400	5	108	400	6	94	583	4	100	387	4	106	488
45-40							1	20	200	3	107	516	9	84	444	4	52	575	7	103	514
40-35										1	63	900	1	63	900	3	63	700	1	70	650
35-30																					
Colorado:																					
55-50																			1	101	950
50-45																2	55	500	3	84	916
45-40										3	94	400	2	78	500	5	47	770	4	56	562
40-35										2	54	525	5	83	530	16	72	431	10	55	535
35-30																			1	125	350
30-25																			1	75	350
25-20																					
Texas:																					
50-45																					
45-40																					
40-35																					
35-30																			1	59	750
30-25																			4	45	187
East Gulf:																					
50-45																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
South Atlantic:																					
50-45																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
Central:																					
50-45																					
45-40																			4	84	600
40-35																			3	65	433
35-30																					
30-25																					

for each 5-degree square of the United States, classified by regions of origin.

95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
8	96	962	11	93	686	2	90	775	1	98	950	1	95	650	2	174	475							55–50.
26	83	588	35	88	687	27	79	687	23	77	643	19	79	540	12	87	442	2	78	475				50–45.
12	76	746	2	62	500	8	73	594	3	71	400	3	34	600										45–40.
			1	60	550																			40–35.
																								35–30.
																								30–25.
																								North Pacific.
																								55–50.
6	75	825	10	74	795	8	84	920	2	96	575	3	98	567	2	94	575							50–45.
5	55	470	2	84	650				2	98	400				1	65	250							45–40.
3	70	400	1	78	700																			40–35.
																								35–30.
																								South Pacific.
																								55–50.
1	60	400	1	90	550	1	93	600	1	105	450	1	115	250										50–45.
3	70	717	1	44	550				1	80	700				3	76	383							45–40.
5	71	440																						40–35.
																								35–30.
																								Northern Rocky Mountain.
																								55–50.
6	105	483	3	92	516	6	76	600	5	73	570	1	78	700										50–45.
2	116	500	2	68	500	6	66	535																45–40.
1	42	1050	2	44	750																			40–35.
																								35–30.
																								Colorado.
																								55–50.
2	78	575	6	86	983	1	85	1100	3	79	633	3	69	500	1	103	450							50–45.
3	75	767	2	102	600	3	74	650	3	87	367	2	72	775										45–40.
4	70	675	1	43	700				3	77	516													40–35.
			1	42	1150				1	30	1100													35–30.
1	66	1050																						30–25.
																								25–20.
																								Texas.
						1	71	650																50–45.
1	55	550	1	78	500	2	68	600																45–40.
1	40	550	1	9	550																			40–35.
7	40	380	5	22	390	2	55	450																35–30.
7	34	261	3	46	367																			30–25.
																								East Gulf.
									1	76	700	2	73	525										50–45.
						1	52	750	3	41	516	4	55	425	2	32	400							45–40.
			1	79	900	4	26	500	5	28	610	1	42	950										40–35.
1	50	1100	4	43	475	7	25	514	2	14	600	1	14	800										35–30.
			6	14	325	9	28	328	1	25	500													30–25.
						3	41	250																25–20.
																								South Atlantic.
																								50–45.
																								45–40.
									2	38	675	3	28	733	1	35	750							40–35.
									2	40	600													35–30.
																								30–25.
																								25–20.
																								Central.
2	82	825	5	95	400	2	90	800	1	75	650	2	72	425										50–45.
11	69	377	17	72	447	8	75	475	1	68	550	5	79	420	1	55	600							45–40.
3	59	650	2	60	775	1	68	800																40–35.
1	70	600																						35–30.
																								30–25.

TABLE 12.—*Number, direction, and speed of movement of October storms*

Longitudes west of Greenwich.	130-125			125-120			120-115			115-110			110-105			105-100			100-95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55-50	1	69	1100	11	89	655	33	100	609	50	100	588	44	109	649	37	105	726	31	105	666
50-45										1	99	750	15	107	620	15	76	543	29	94	624
45-40																8	89	500	9	69	761
40-35																			1	40	450
35-30																					
North Pacific:																					
55-50				5	75	680	5	81	500	7	79	486	6	103	492	4	106	440	2	92	400
50-45	13	61	600	17	78	715	5	88	590	6	103	542	10	93	450	6	115	475	4	83	862
45-40				7	83	507	10	82	600	4	79	762	4	106	488	12	89	488	10	59	450
40-35							3	73	667	4	61	787	2	43	725	7	83	371	6	40	425
35-30																					
South Pacific:																					
55-50				1	68	350	1	68	350	2	95	325	2	112	500	1	134	700			
50-45				2	54	650	1	150	250	1	111	600				1	57	500	2	70	775
45-40	3	31	750	4	56	562	1	35	550	1	23	550	1	88	550	3	60	550	5	46	520
40-35	1	20	350	4	68	362	5	86	740	9	85	611	10	108	460	5	56	740	4	60	550
35-30							1	47	350	9	69	528	3	106	467	2	60	625	1	43	600
30-25																			1	23	850
Northern Rocky Mountain:																					
55-50										1	84	600	1	95	1,100				1	99	900
50-45										4	86	687	4	93	475	4	102	500	4	88	625
45-40										1	52	400	1	136	350	5	113	430	6	58	517
40-35																2	120	550	3	33	450
35-30																					
Colorado:																					
55-50																			2	85	375
50-45													1	60	350	5	64	460	5	56	650
45-40										8	73	656	4	93	550	9	54	572	17	49	500
40-35										7	76	430	12	78	550	31	69	502	23	64	567
35-30										1	63	800	2	59	800	4	82	700			
30-25																			1	46	800
Texas:																					
50-45																2	12	350			
45-40																1	−15	600			
40-35													2	46	450	1	− 3	650	2	26	250
35-30													4	85	425	9	111	372	4	56	725
30-25																2	86	450	10	46	815
East Gulf:																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
South Atlantic:																					
50-45																					
45-40																					
40-35																					
35-30																					
30-25																					
25-20																					
Central:																					
50-45																					
45-40																			4	71	700
40-35																			1	54	400
35-30																					
30-25																					

for each 5-degree square of the United States, classified by regions of origin.

95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
8	102	606	6	96	667	3	90	617	1	106	650													55–50.
29	91	612	35	87	626	33	88	667	21	91	626	16	88	556	11	100	468	2	98	450				50–45.
13	58	461	8	66	594	6	63	650	9	82	494	8	56	431	7	58	464	2	56	550				45–40.
2	15	275										2	47	350										40–35.
																								35–30.
																								North Pacific.
2	94	400	2	111	725	2	112	650																55–50.
5	84	530	8	95	725	5	105	650	1	113	300	2	74	525										50–45.
5	49	450	2	61	425	5	79	470	3	80	367	7	47	280	1	50	300							45–40.
2	26	300				1	85	450																40–35.
1	0	350																						35–30.
																								South Pacific.
																								55–50.
2	94	650	4	59	587	3	77	450	1	78	950													50–45.
5	58	590	3	77	613	2	61	825				3	34	267										45–40.
3	58	600	1	75	700	1	88	450																40–35.
			1	90	750	1	88	450	1	56	300													35–30.
																								30–25.
																								Northern Rocky Mountain.
																								55–50.
6	80	492	3	80	567	4	97	562	1	85	450	2	72	500	1	73	350							50–45.
2	18	475	2	50	575	1	68	750																45–40.
1	57	400																						40–35.
																								35–30.
																								Colorado.
1	98	850	2	87	950							2	95	900										55–50.
3	95	667	6	83	667	4	67	850				2	95	900	2	107	400							50–45.
15	58	540	3	53	467	5	74	620	4	56	475	5	30	270	2	46	425							45–40.
4	59	700	2	104	525	2	81	575	1	52	400	1	40	350										40–35.
			1	40	600																			35–30.
1	31	1100																						30–25.
																								Texas.
1	76	200	5	89	230	3	88	600	1	86	400	2	77	750										50–45.
9	30	290	2	82	275	3	52	567	3	53	767	1	50	400										45–40.
5	30	575	2	− 8	600	3	54	633	2	54	625				1	49	850							40–35.
5	29	650	5	58	560	1	78	550	1	65	600	1	30	800	1	49	850							35–30.
4	49	575	3	66	683	1	106	350	1	50	800	1	30	800										30–25.
																								East Gulf.
												2	55	675	2	62	500							45–40.
						1	61	750	4	55	440	3	43	783										40–35.
			2	50	625	5	38	670	4	35	675	1	32	550										35–30.
			2	42	575	5	24	560	2	23	575													30–25.
						2	24	425																25–20.
																								South Atlantic.
																		2	19	600				50–45.
						1	59	800				2	55	275	4	33	487	2	45	700				45–40.
						1	31	800	1	−20	250	5	38	340	5	27	540							40–35.
						1	− 5	700	5	− 6	440	3	19	713										35–30.
									6	4	408	1	55	600										30–25.
																								25–20.
																								Central.
			2	72	450	2	88	575	2	74	625	2	44	375	1	33	250							50–45.
3	62	433	4	74	650	3	73	533	3	50	516	5	50	640	3	56	516							45–40.
1	67	650																						40–35.
																								35–30.
																								30–25.

TABLE 13.—*Number, direction, and speed of movement of November storms*

Longitudes west of Greenwich.	130–125			125–120			120–115			115–110			110–105			105–100			100–95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55–50	6	89	700	16	93	710	27	96	722	53	99	685	41	107	780	40	113	805	25	109	720
50–45	1	130	250	1	130	250	1	105	1250	5	95	590	8	118	694	9	91	711	30	107	745
45–40				2	105	350	3	100	450	6	97	575	3	113	667	6	82	617	5	90	700
40–35													2	95	375	5	72	600	6	52	750
35–30																			1	42	750
North Pacific:																					
55–50	1	95	500	10	84	815	12	78	663	14	98	743	12	109	758	9	104	700	5	107	760
50–45	29	69	598	33	72	723	25	95	606	16	113	584	16	101	675	15	85	647	12	89	783
45–40	5	22	420	8	51	670	3	73	467	7	100	593	17	111	671	9	70	833	5	57	675
40–35													1	110	400	4	98	588	4	57	812
35–30																1	157	500	1	38	550
30–25																1	130	350			
South Pacific:																					
55–50																					
50–45										1	85	450	1	85	450	1	92	650			
45–40				2	100	350				3	72	733				2	71	725	2	44	725
40–35				4	76	525	8	84	681	8	74	313	8	63	625	8	70	731	6	64	600
35–30							1	91	850	11	83	486	6	86	800	5	86	650	4	20	388
30–25																			4	40	525
Northern Rocky Mountain:																					
55–50																					
50–45										2	125	800				1	102	750			
45–40													6	122	642	8	106	669	5	97	640
40–35													1	70	900	3	86	733	4	72	688
35–30																1	106	450	2	86	625
Colorado:																					
55–50																					
50–45																					
45–40										3	94	700	6	99	617	4	87	762	7	45	643
40–35										5	59	670	8	96	556	25	74	592	17	69	642
35–30							1	51	400	1	5	200							9	74	544
Texas:																					
50–45																					
45–40																1	48	1000			
40–35																			6	36	708
35–30													2	101	575	6	60	592	10	54	560
30–25																3	28	733	10	45	595
East Gulf:																					
50–45																					
45–40																					
40–35																					
35–30																					
30–25																					
25–20																					
South Atlantic:																					
50–45																					
45–40																					
40–35																					
35–30																					
30–25																					
25–20																					
Central:																					
50–45																2	110	525	6	80	683
45–40																2	147	350	8	75	556
40–35																2	72	475	10	86	515
35–30																			2	175	225
30–25																			3	81	233

for each 5-degree square of the United States, classified by regions of origin.

Longitudes west of Greenwich.	95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Numbr of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta.																								
55–50.	12	112	521	5	99	530	3	98	600	2	78	625	...	...	...	...	...	...	...	...	...	...	...	...
50–45.	27	87	654	34	85	618	34	94	646	19	83	658	10	88	650	5	99	470	1	100	300	...	...	...
45–40.	10	74	700	15	66	650	12	87	750	5	66	840	11	53	623	5	57	510	1	42	500	...	...	...
40–35.	7	53	693	4	62	750	1	49	1000	2	28	725	1	45	700	...	...	...	...	...	...	...	...	...
35–30.	...	...	...	1	27	450	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
North Pacific.																								
55–50.	2	90	600	1	83	750	1	84	750	...	...	...	1	145	500	1	145	500	...	...	...	...	...	...
50–45.	11	90	682	15	89	737	12	81	712	8	78	662	4	81	550	2	124	550	...	...	...	...	...	...
45–40.	8	60	844	8	76	769	6	66	567	6	66	467	3	48	333	1	35	250	2	64	425	...	...	...
40–35.	6	67	650	1	80	300	3	75	567	1	31	550	2	27	450	...	...	...	...	...	...	...	...	...
35–30.	1	35	950	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30–25.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
South Pacific.																								
55–50.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
50–45.	2	72	825	4	80	850	...	...	...	1	65	600	...	...	...	...	...	...	...	...	...	...	...	...
45–40.	3	48	633	4	72	638	3	84	733	1	58	950	1	54	400	1	52	500	...	...	...	...	...	...
40–35.	6	58	742	3	67	550	1	36	400	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35–30.	3	49	800	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30–25.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Northern Rocky Mountain.																								
55–50.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
50–45.	...	...	...	1	84	1100	1	71	700	1	60	300	2	64	375	1	28	350	...	...	...	...	...	...
45–40.	4	88	700	3	66	750	1	81	700	1	50	400	...	...	...	...	...	...	...	...	...	...	...	...
40–35.	4	60	625	...	...	...	...	...	...	2	55	350	1	42	500	...	...	...	...	...	...	...	...	...
35–30.	2	98	525	1	42	700	1	37	650	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Colorado.																								
55–50.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
50–45.	...	...	...	3	66	850	4	68	950	3	58	833	1	80	800	...	...	...	...	...	...	...	...	...
45–40.	11	59	736	7	63	879	4	71	787	2	62	450	2	50	650	1	60	550	1	60	550	...	...	...
40–35.	8	69	556	3	66	656	1	45	500	1	57	700	1	55	800	...	...	...	...	...	...	...	...	...
35–30.	6	65	602	1	45	750	1	45	500	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Texas.																								
50–45.	...	...	...	2	76	575	2	70	700	2	76	825	1	80	650	1	125	500	1	100	300	...	...	...
45–40.	...	...	...	4	53	675	5	55	680	4	69	650	1	66	550	4	54	562	...	...	...	...	...	...
40–35.	10	43	860	3	45	883	3	22	383	4	38	588	3	44	667	...	...	...	...	...	...	...	...	...
35–30.	13	57	712	13	74	531	6	50	567	4	45	612	...	...	...	...	...	...	...	...	...	...	...	...
30–25.	8	64	538	4	74	400	2	60	625	1	60	950	...	...	...	...	...	...	...	...	...	...	...	...
East Gulf.																								
50–45.	...	...	...	...	...	...	...	...	...	...	...	...	2	60	400	2	74	450	1	87	350	...	...	...
45–40.	...	...	...	...	...	...	...	...	...	1	43	500	5	25	410	4	36	462	...	...	...	...	...	...
40–35.	...	...	...	...	...	...	1	67	650	4	36	638	4	37	712	...	...	...	...	...	...	...	...	...
35–30.	...	...	...	8	56	656	9	38	739	2	32	750	1	36	950	...	...	...	...	...	...	...	...	...
30–25.	...	...	...	1	45	500	2	26	1000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25–20.	...	...	...	...	...	...	2	6	450	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
South Atlantic.																								
50–45.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	45	600	1	135	250	...	...	...
45–40.	...	...	...	...	...	...	...	...	...	...	...	...	10	42	480	5	34	560	1	65	550	...	...	...
40–35.	...	...	...	...	...	...	...	...	...	8	50	500	18	35	542	...	...	...	...	...	...	...	...	...
35–30.	...	...	...	...	...	...	5	53	630	9	43	561	7	24	543	1	107	350	...	...	...	...	...	...
30–25.	...	...	...	...	...	...	1	30	500	2	28	550	3	−12	367	...	...	...	...	...	...	...	...	...
25–20.	...	...	...	...	...	...	...	...	...	1	21	600	...	...	...	...	...	...	...	...	...	...	...	...
Central.																								
50–45.	4	74	638	3	100	650	3	97	817	3	70	500	2	87	525	1	69	700	1	135	250	...	...	...
45–40.	7	58	557	10	73	765	6	61	625	7	71	507	6	44	553	6	45	492	...	...	...	...	...	...
40–35.	6	74	783	5	62	810	2	62	700	...	...	...	2	34	500	...	...	...	...	...	...	...	...	...
35–30.	3	32	700	1	65	700	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30–25.	1	45	300	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

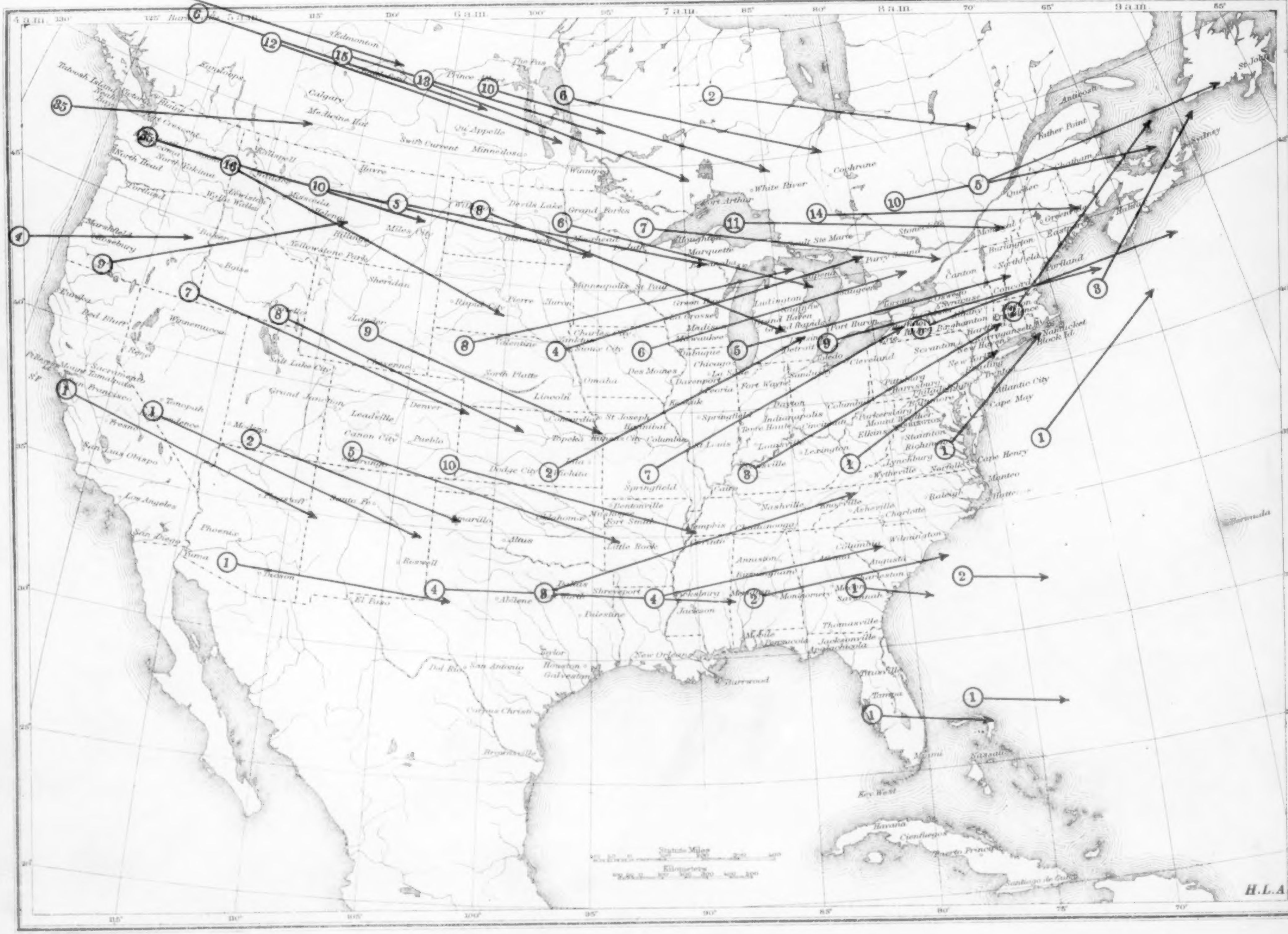
TABLE 14.—*Number, direction, and speed of movement of December storms*

Longitudes west of Greenwich.	130–125			125–120			120–115			115–110			110–105			105–100			100–95		
Type and north latitudes.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.
Alberta:																					
55–50				13	96	792	26	94	673	54	101	704	47	110	737	39	108	792	31	107	748
50–45										5	112	920	11	114	923	18	103	786	30	96	775
45–40																4	91	825	7	79	650
40–35																4	109	625	3	54	933
35–30																1	120	400	2	116	450
30–25																			1	61	450
North Pacific:																					
55–50	4	63	488	14	85	686	17	85	626	21	102	643	11	109	664	7	105	821	5	102	800
50–45	33	70	692	34	72	759	8	101	850	9	114	756	6	124	871	6	83	608	7	92	630
45–40	4	82	700	7	84	807	4	112	862	6	122	892	8	106	750	9	87	833	6	50	600
40–35				1	69	1000	1	77	1050	2	98	325	5	101	710	7	74	807	10	61	617
35–30													8	89	825	3	61	700	5	43	660
30–25																					
South Pacific:																					
55–50																					
50–45																					
45–40	3	3	166							1	80	800				2	86	575	2	66	675
40–35	1	—2	150	1	62	900	4	92	575	11	90	541	10	83	725	5	66	850	3	60	883
35–30							7	69	550	18	74	467	4	96	562	2	59	700	5	38	900
30–25																			5	48	700
Northern Rocky Mountain:																					
55–50																					
50–45										1	129	850	2	91	825				1	75	600
45–40													3	91	867	3	80	833	1	47	800
40–35																1	58	1050	1	58	1050
35–30																					
Colorado:																					
55–50																					
50–45																			1	127	600
45–40													4	80	488	7	104	507	7	87	471
40–35										5	105	730	5	83	700	16	95	656	12	57	792
35–30													2	74	600	7	115	543	10	75	620
30–25																			6	66	533
Texas:																					
50–45																					
45–40																			1	17	500
40–35																			4	18	625
35–30													2	106	650	8	54	900	20	62	752
30–25																5	53	660	32	55	791
25–20																					
East Gulf:																					
45–40																					
40–35																					
35–30																					
30–25																					
25–20																					
South Atlantic:																					
50–45																					
45–40																					
40–35																					
35–30																					
30–25																					
25–20																					
Central:																					
50–45																1	88	650	1	102	800
45–40																			1	88	800
40–35																			2	104	375
35–30																			2	98	425
30–25																					

for each 5-degree square of the United States, classified by regions of origin.

95–90			90–85			85–80			80–75			75–70			70–65			65–60			60–55			Longitudes west of Greenwich.
Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Number of observations.	Average direction of 24-hour movement in degrees E. of N.	Average 24-hour movement in miles.	Type and north latitudes.
																								Alberta.
7	95	721	3	99	783										1	95	600							55–50.
28	93	657	36	96	688	32	84	767	21	87	700	8	84	638	7	90	564							50–45.
10	72	695	8	70	850	12	78	862	5	62	810	5	51	670	8	43	462	1	62	850				45–40.
4	78	775	5	76	940	2	66	1000	2	54	1050	1	50	950										40–35.
																								35–30.
																								30–25.
																								North Pacific.
2	96	1125	2	94	775																			55–50.
12	88	679	13	84	804	11	84	795	6	80	733	5	77	650	3	81	516							50–45.
6	50	640	10	69	800	6	69	916	3	75	800	4	50	800	1	43	600							45–40.
9	50	644	5	67	630	5	73	820	3	44	730	4	51	675	1	45	500							40–35.
6	62	792	3	67	650	4	62	640	2	47	750	1	35	450										35–30.
						1	55	850																30–25.
																								South Pacific.
																								55–50.
			2	86	775	1	70	800	2	70	925													50–45.
3	66	683	6	56	633	4	69	825	1	75	750	2	56	400										45–40.
8	51	775	6	46	733				2	44	750	1	56	550										40–35.
3	31	733	2	24	875																			35–30.
																								30–25.
																								Northern Rocky Mountain.
																								55–50.
1	110	800	2	82	1000	1	82	800	1	63	900				1	100	450							50–45.
3	62	800	1	75	750	1	75	1050	2	66	1075													45–40.
2	64	975																						40–35.
																								35–30.
																								Colorado.
																								55–50.
			2	92	450	4	76	762	3	75	767	1	55	800	1	63	500							50–45.
5	82	610	8	66	812	9	62	861	3	58	633	4	50	550	2	52	475	1	60	400				45–40.
13	48	719	10	44	855				2	50	525	2	48	825										40–35.
6	42	750	3	53	883				1	31	800													35–30.
2	30	575	2	42	725	1	41	700																39–25.
																								Texas.
1	47	450	1	76	500	1	76	750	1	75	750	1	71	900	1	64	500							50–45.
4	29	625	4	40	562	7	51	871	12	54	850	8	53	744	1	51	900							45–40.
13	44	762	12	45	771	8	48	850	8	39	806	5	44	800										40–35.
23	52	685	19	59	868	4	50	775	4	36	825													35–30.
21	45	660	10	51	865	3	128	183																30–25.
1	26	725																						25–20.
																								East Gulf.
									2	38	675				1	44	700							45–40.
						1	36	1000	3	38	750	2	36	775										40–35.
1	87	450	3	55	717	3	31	750	1	39	650													35–30.
			1	51	900																			30–25.
						1	25	800																25–20.
																								South Atlantic.
																								50–45.
									1	40	500	4	42	562	1	61	350							45–40.
						1	41	1000	5	37	790	7	44	679	2	50	325							40–35.
									2	38	1025	1	41	250										35–30.
																								30–25.
																								25–20.
																								Central.
1	77	350	2	81	400	4	95	625	1	65	500	1	85	600										50–45.
2	75	725	2	74	600	2	78	400	5	86	490	4	55	600	1	55	550							45–40.
5	71	530	2	86	725	1	76	650	2	39	625	4	45	500	2	40	575							40–35.
2	90	700				1	64	600	1	55	450	1	42	500										35–30.
																								30–25.

Chart 3.—Average 24-hour movement of storms, by 5°-squares. January—North Pacific type.



H.L.A.

Chart 4.—Average 24-hour movement of storms, by 5°-squares. January—South Pacific type.

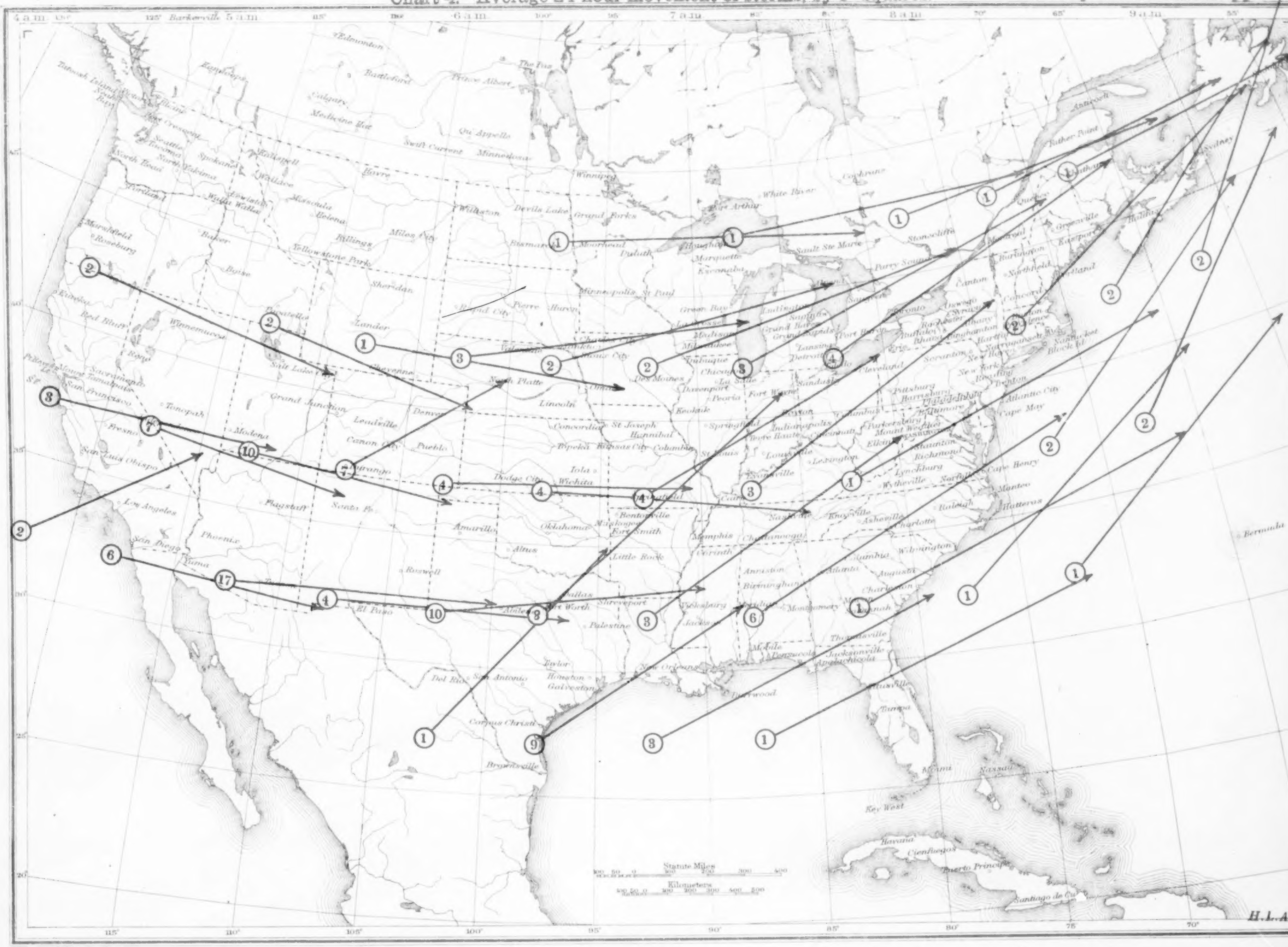


Chart 5.—Average 24-hour movement of storms, by 5°-squares. January—Northern Rocky Mountain type.

Chart 6.—Average 24-hour movement of storms, by 5°-squares. January—Colorado type.

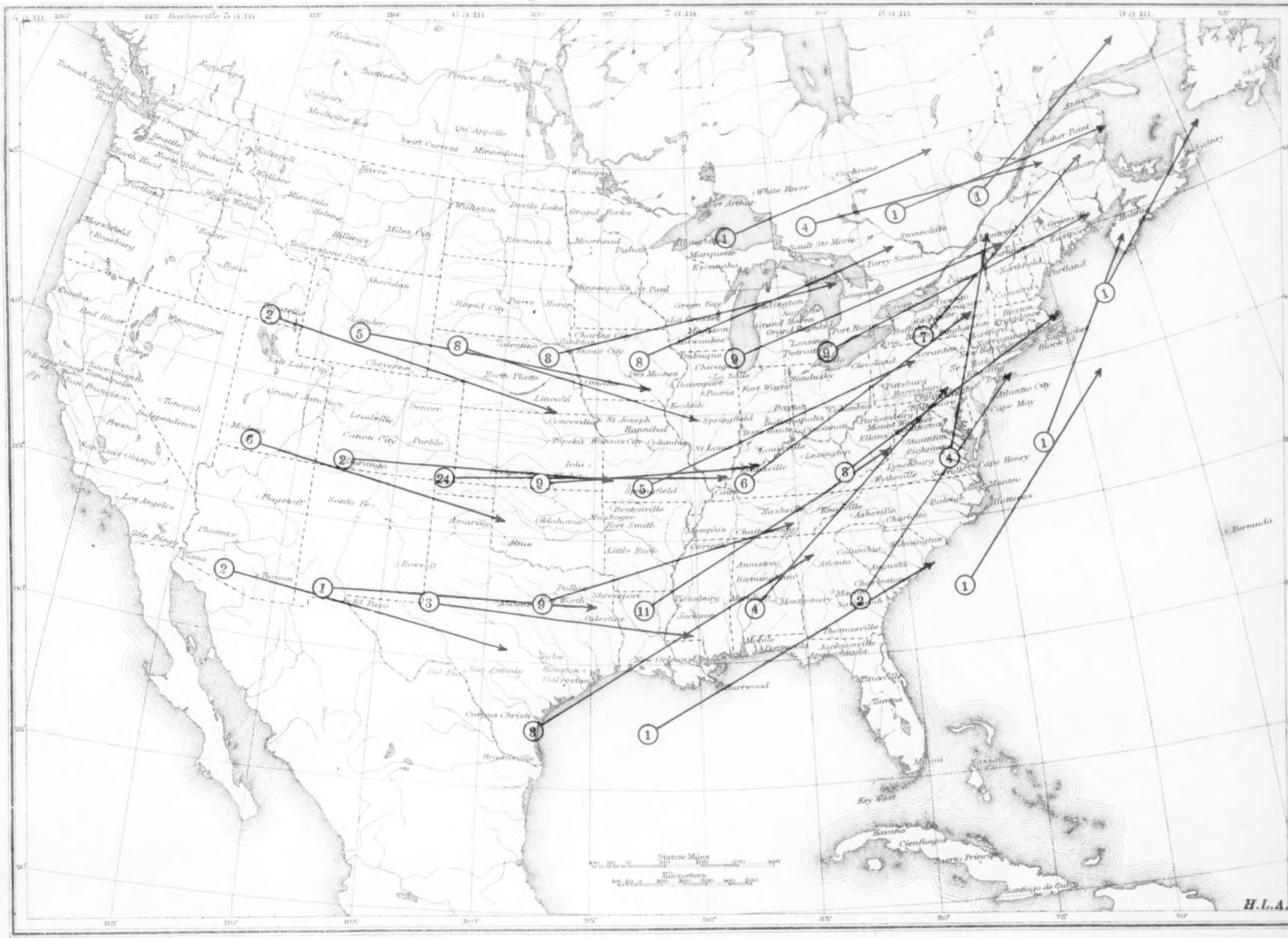


Chart 7.—Average 24-hour movement of storms, by 5°-squares. January—Texas type.

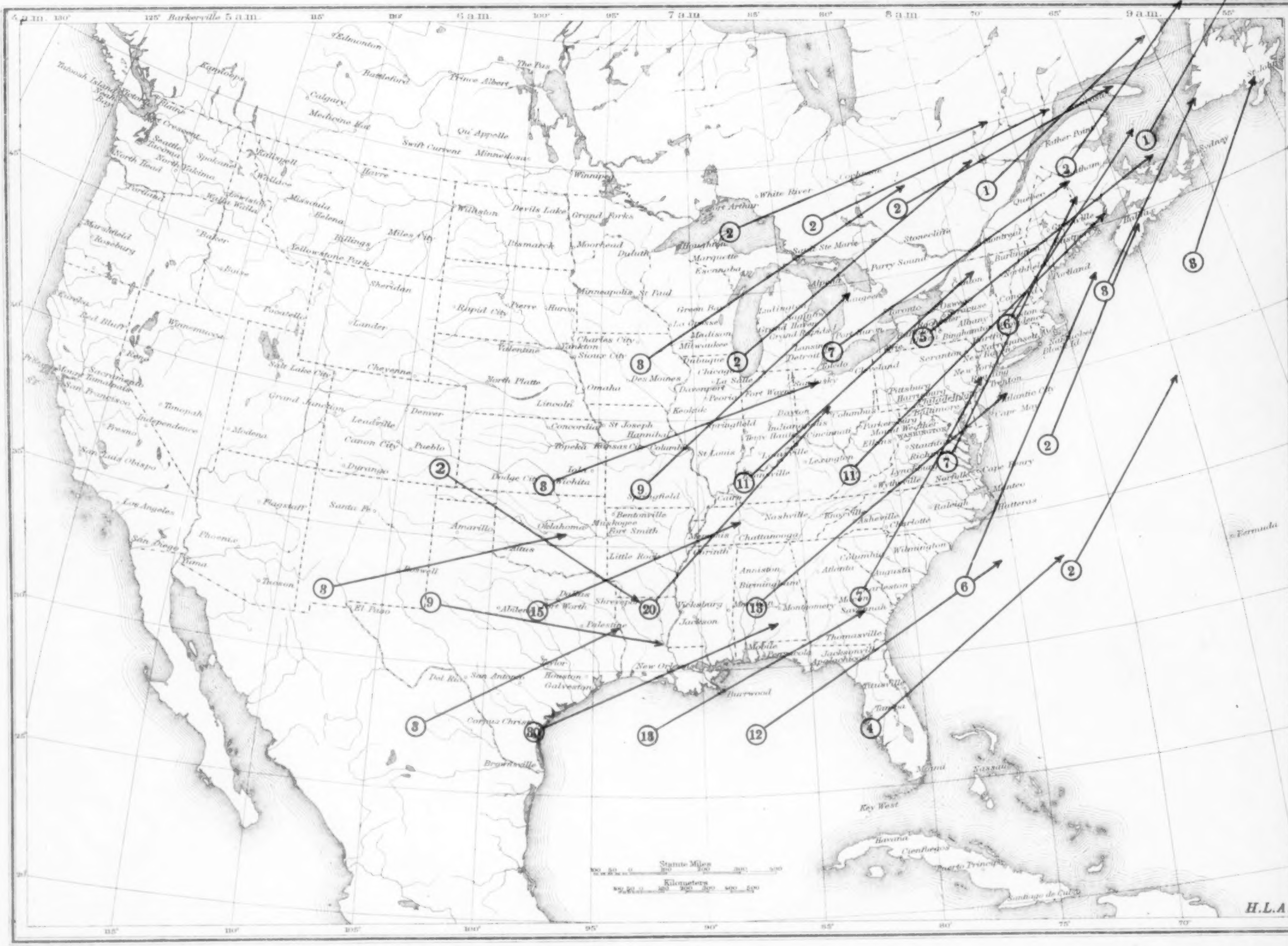


Chart 8.—Average 24-hour movement of storms, by 5°-squares.

January—East Gulf type.

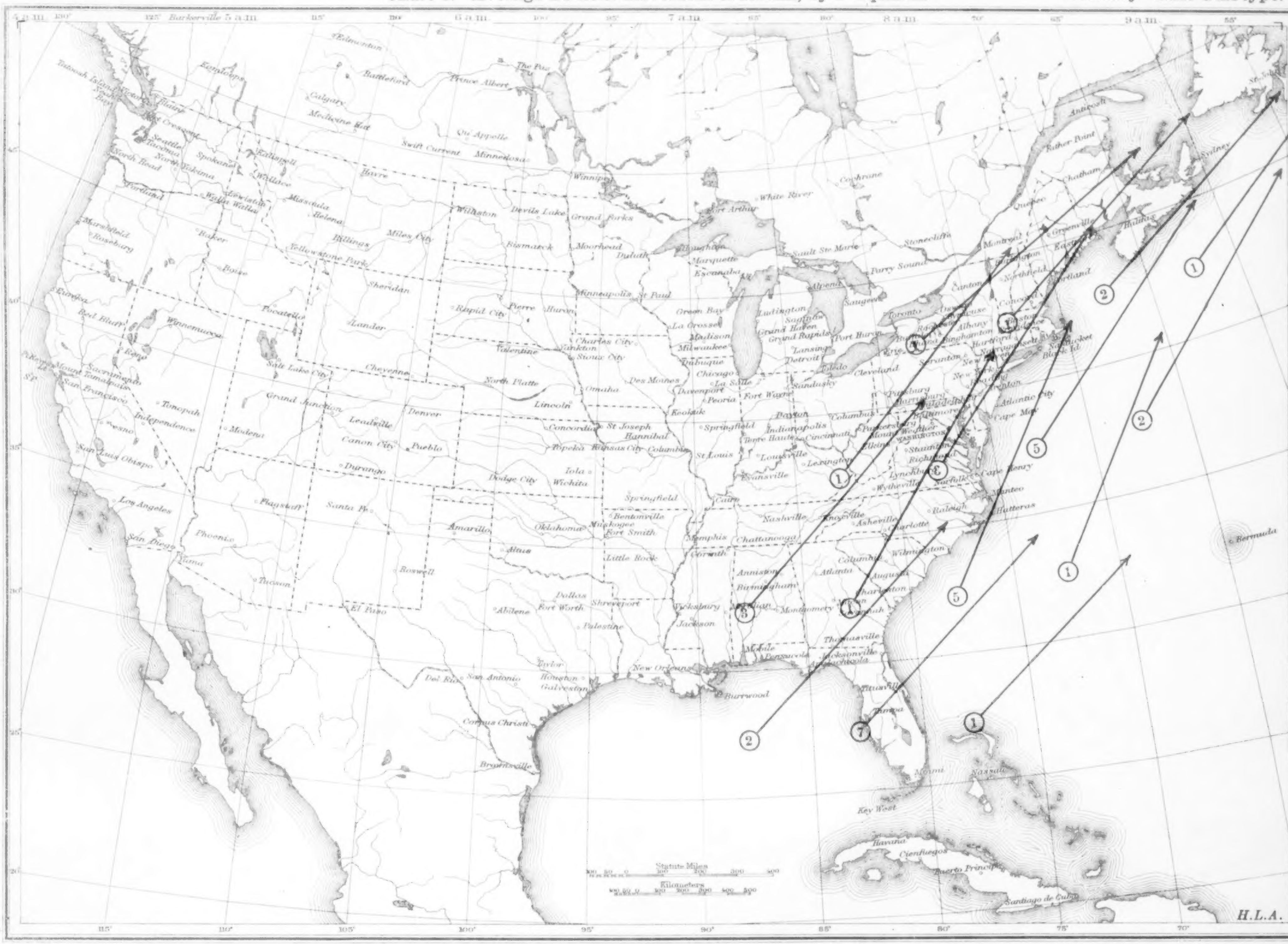


Chart 9.—Average 24-hour movement of storms, by 5°-squares.

January—South Atlantic type.

Chart 10.—Average 24-hour movement of storms, by 5°-squares.

January—Central type.

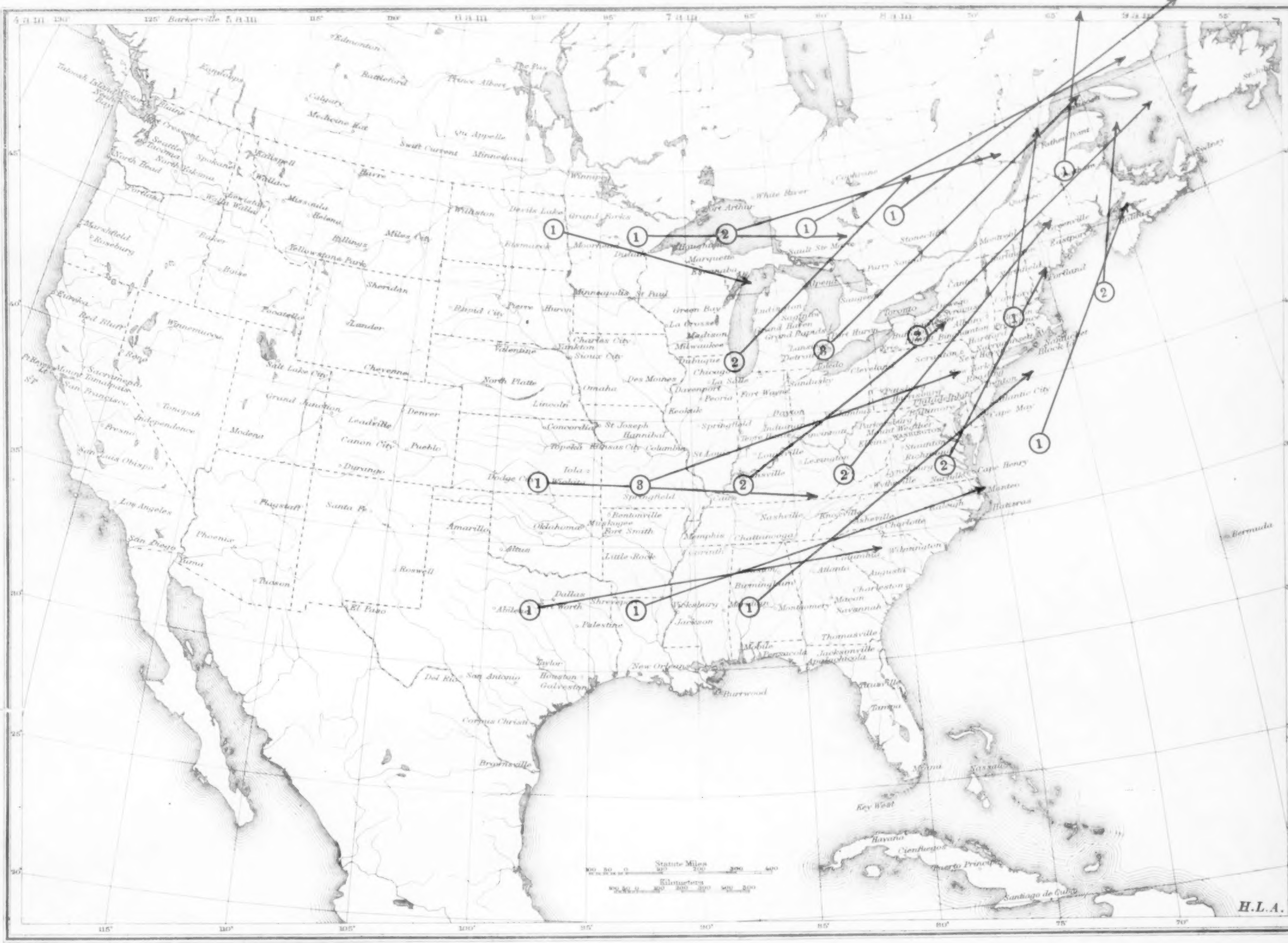


Chart 11.—Average 24-hour movement of storms, by 5°-squares.

February—Alberta type.

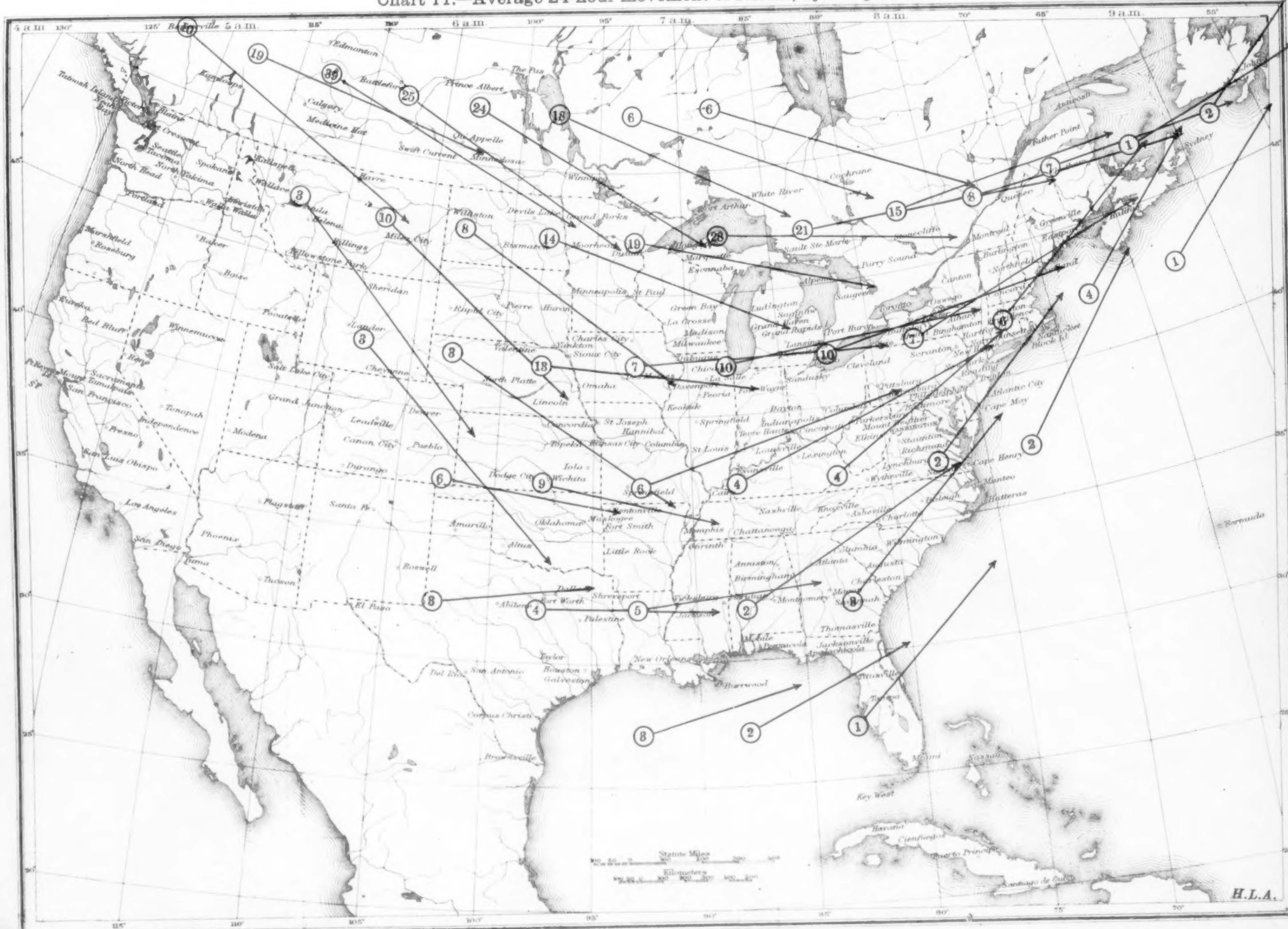


Chart 12.—Average 24-hour movement of storms, by 5°-squares. February—North Pacific type.

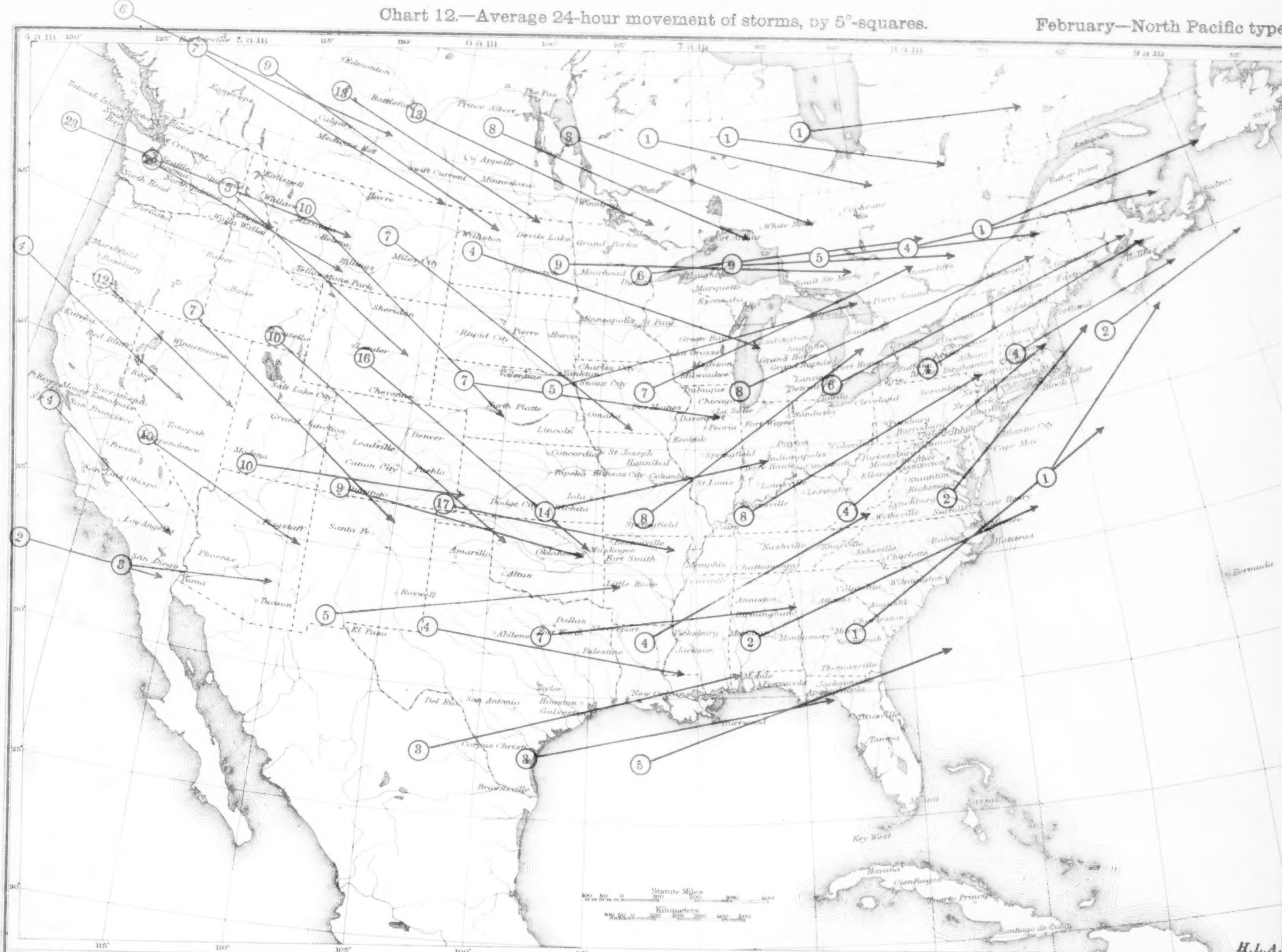


Chart 13.—Average 24-hour movement of storms, by 5°-squares. February—South Pacific type.

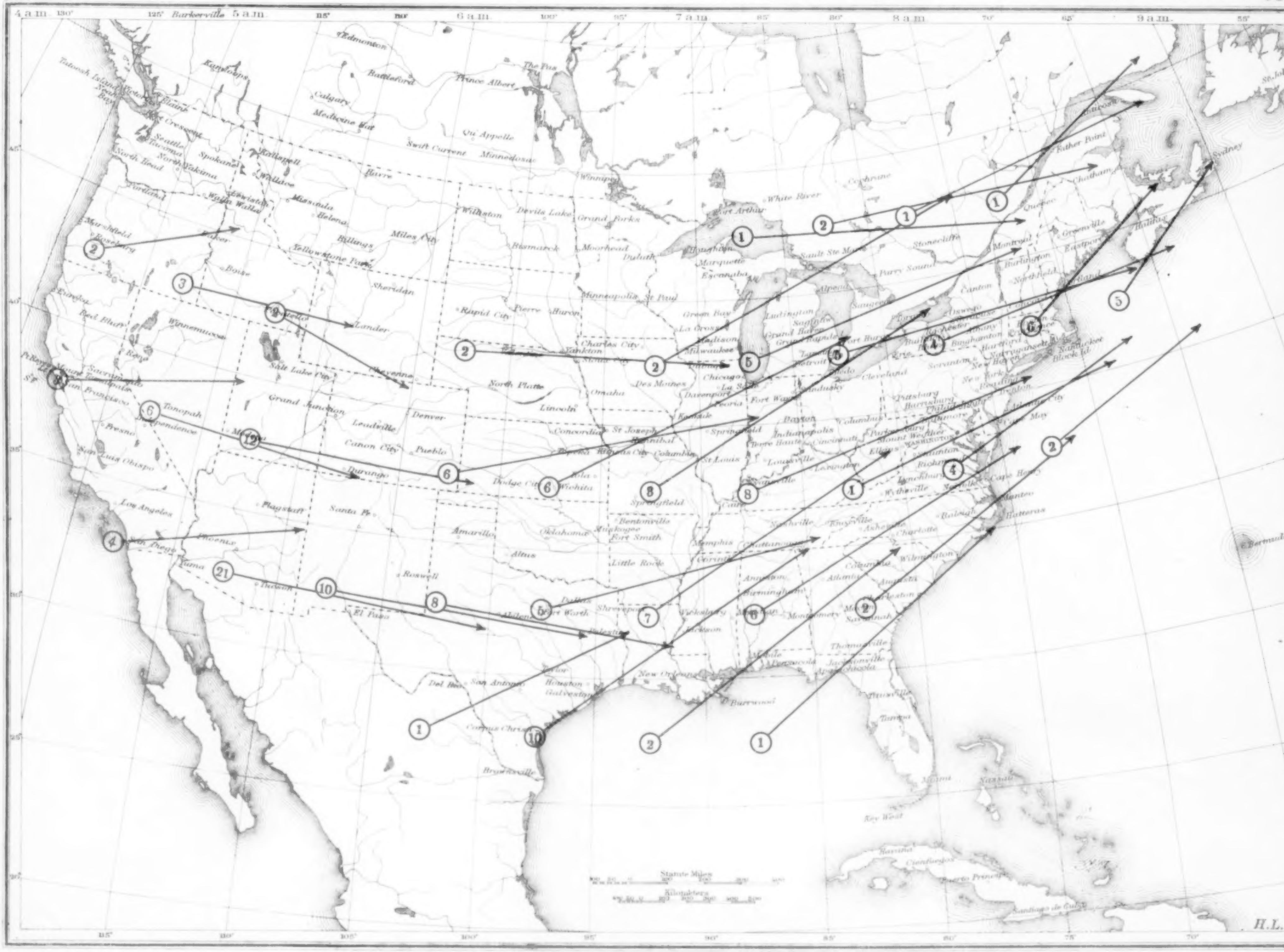
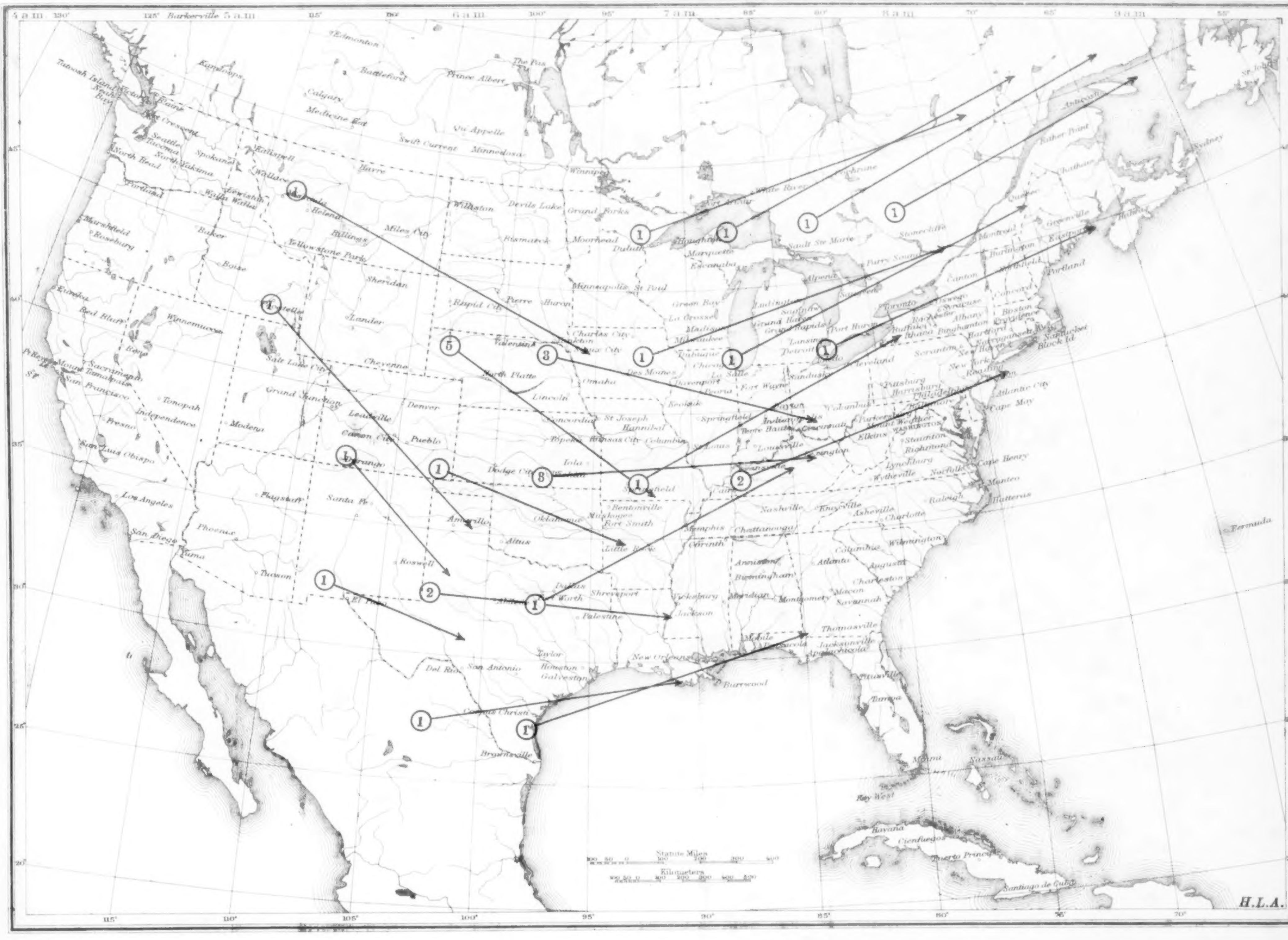


Chart 14.—Average 24-hour movement of storms, by 5°-squares. February—Northern Rocky Mountain type.



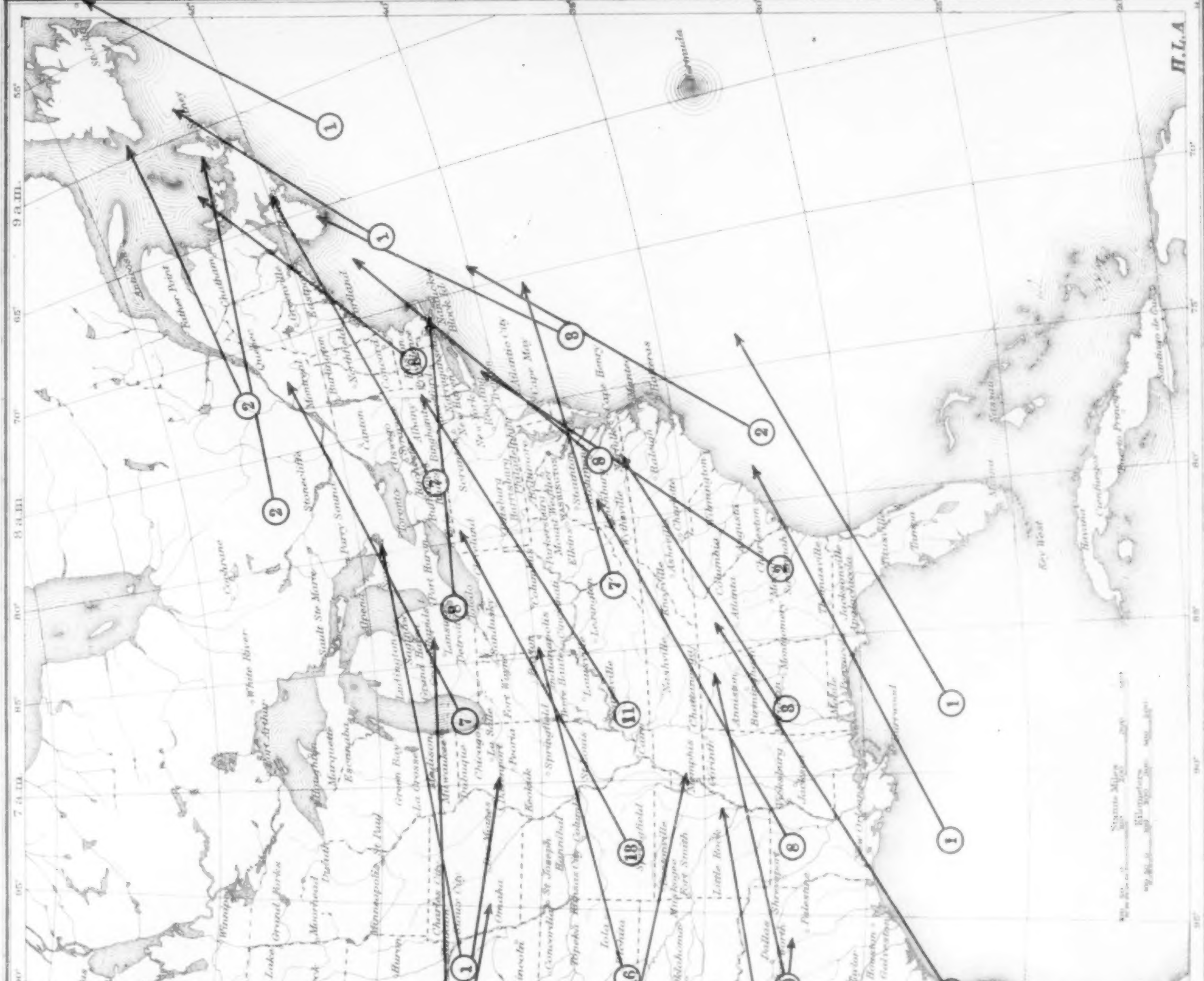


Chart 15.—Average 24-hour movement of storms, by 5°-squares. February—Colorado type.

Chart 16.—Average 24-hour movement of storms, by 5°-squares.

February—Texas type.

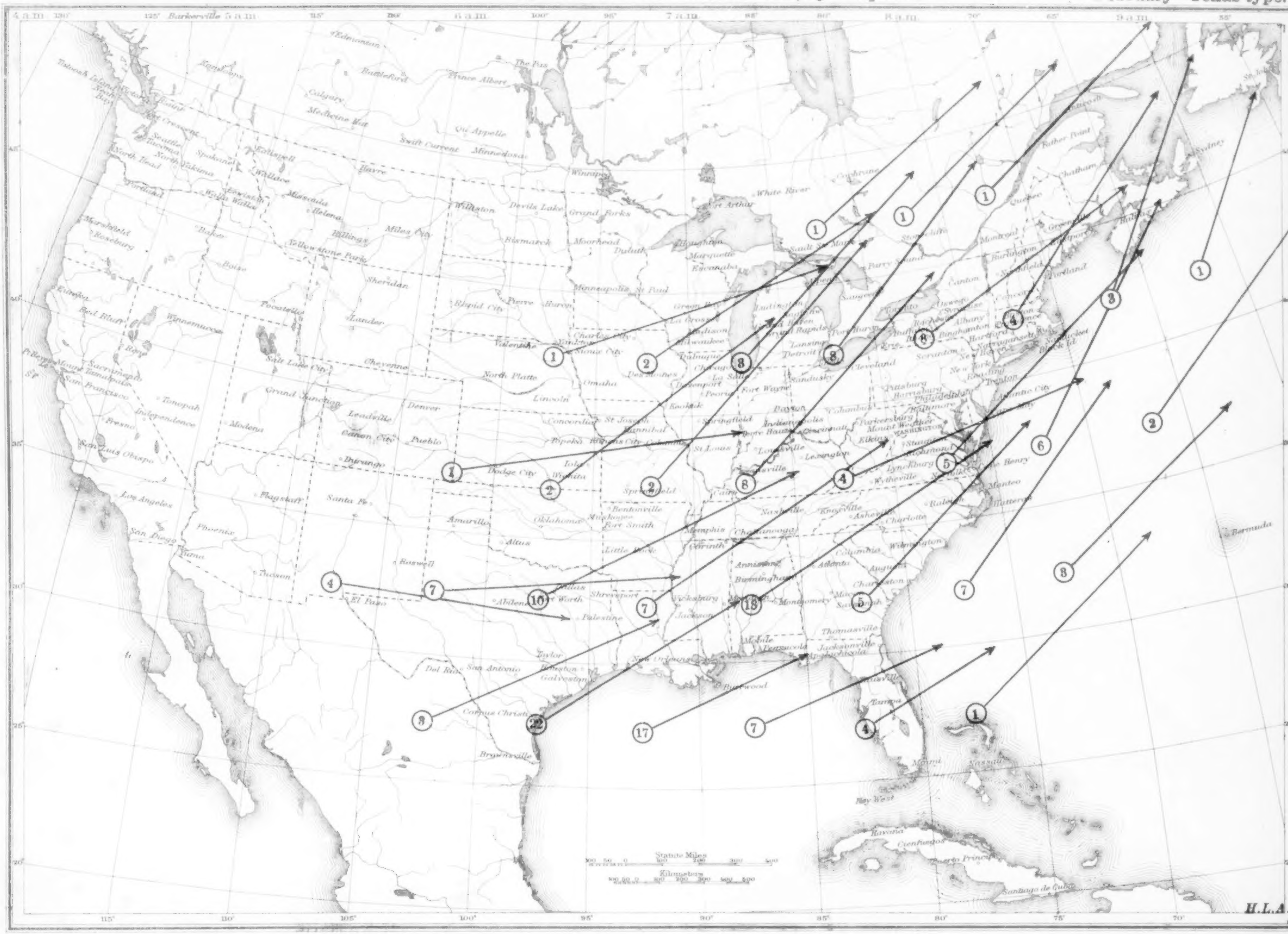


Chart 17.—Average 24-hour movement of storms, by 5°-squares.

February—East Gulf type.

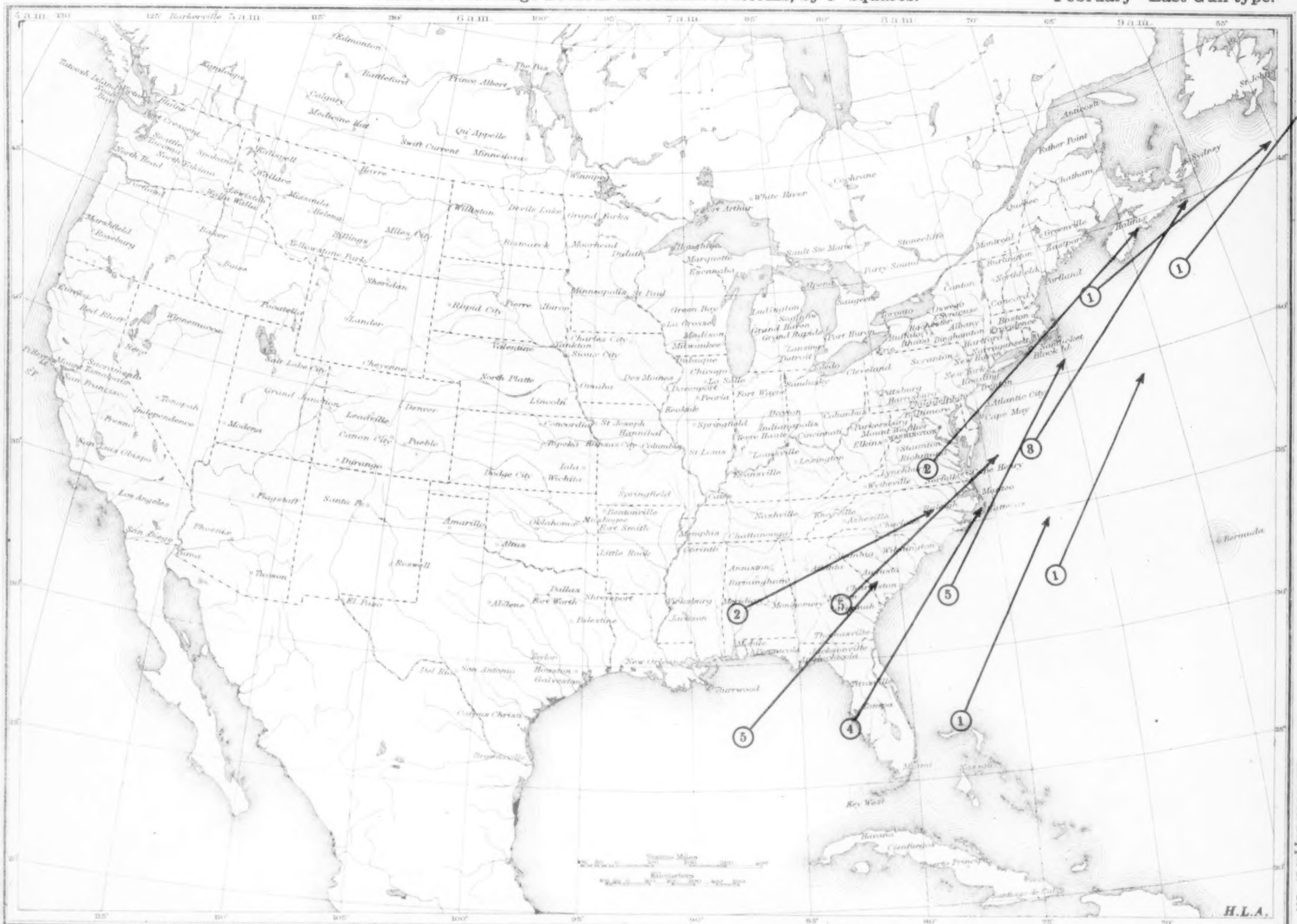


Chart 18.—Average 24-hour movement of storms, by 5°-squares.

February—South Atlantic type.

Chart 19.—Average 24-hour movement of storms, by 5°-squares.

February—Central type.

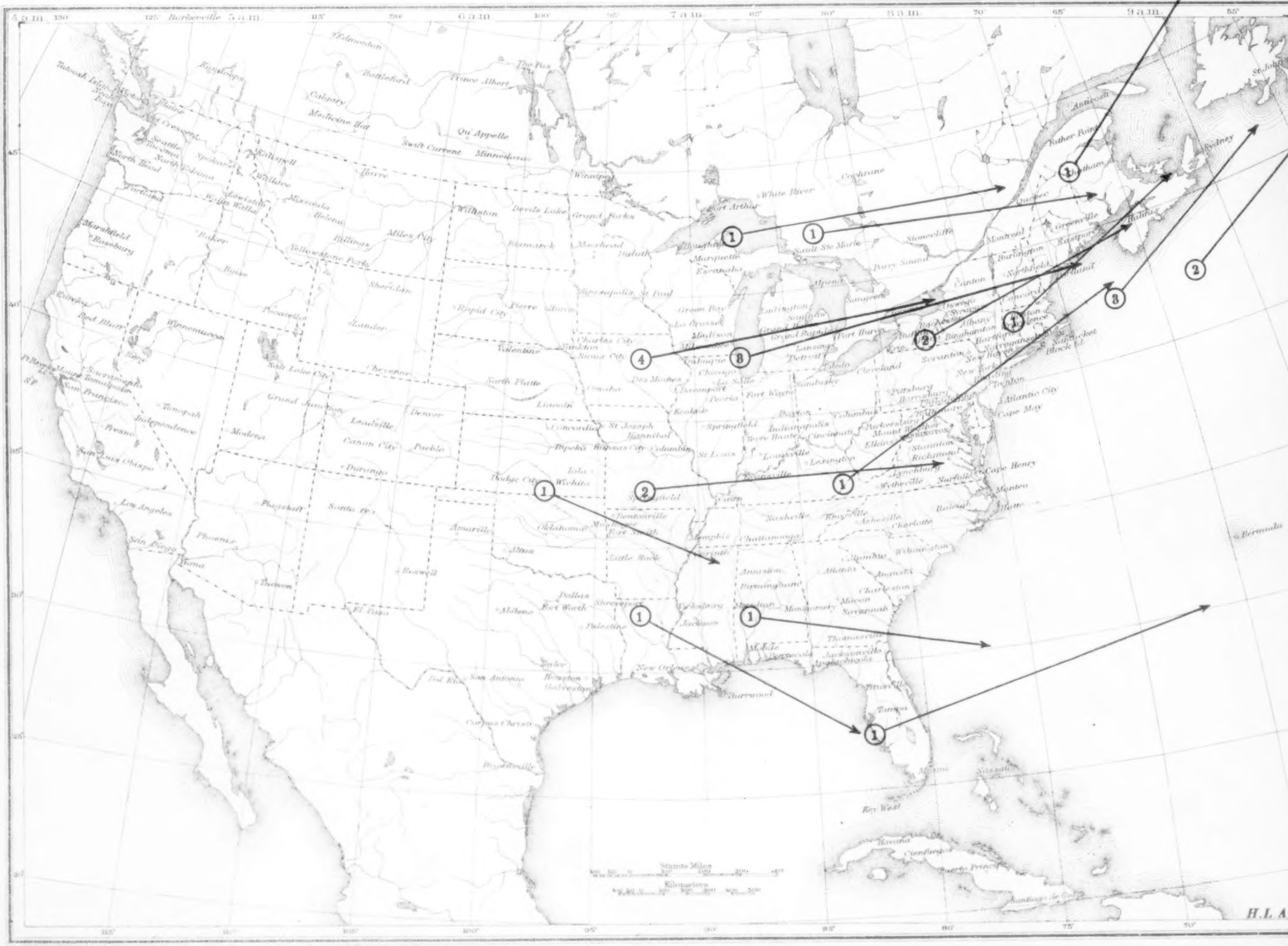


Chart 20.—Average 24-hour movement of storms, by 5°-squares.

March—Alberta type.

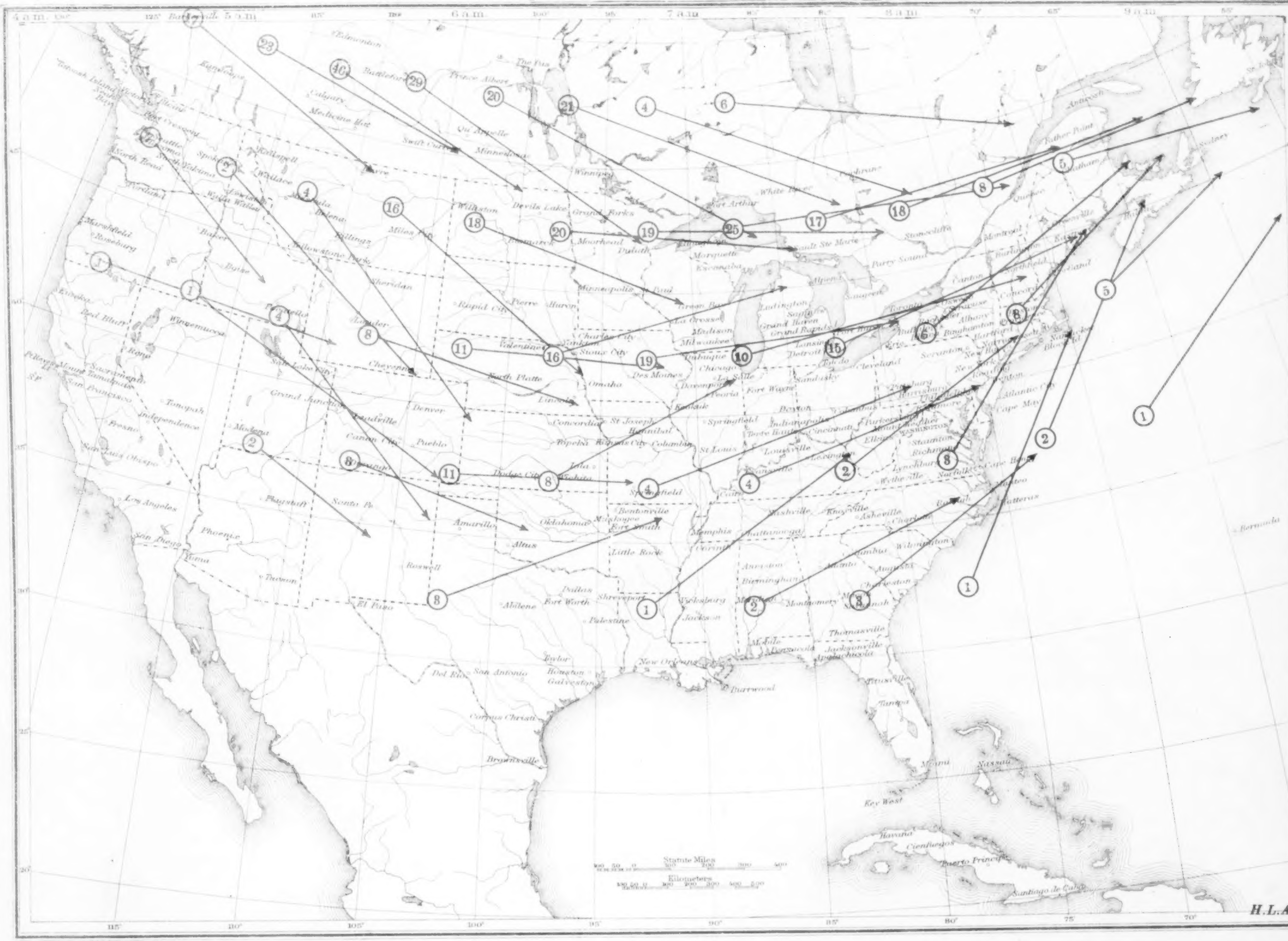


Chart 21.—Average 24-hour movement of storms, by 5°-squares. March—North Pacific type.

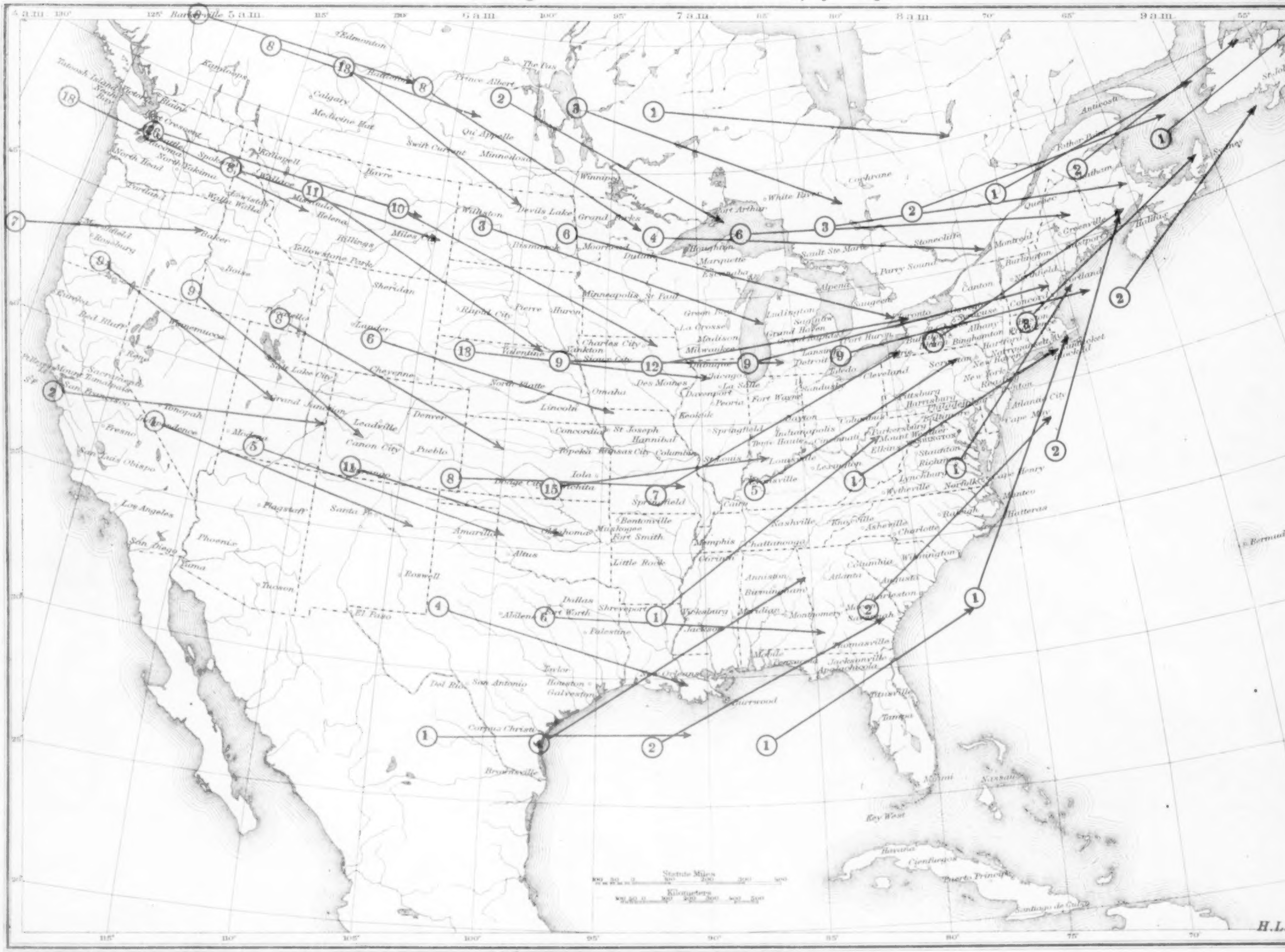


Chart 22.—Average 24-hour movement of storms, by 5°-squares. March—South Pacific type.

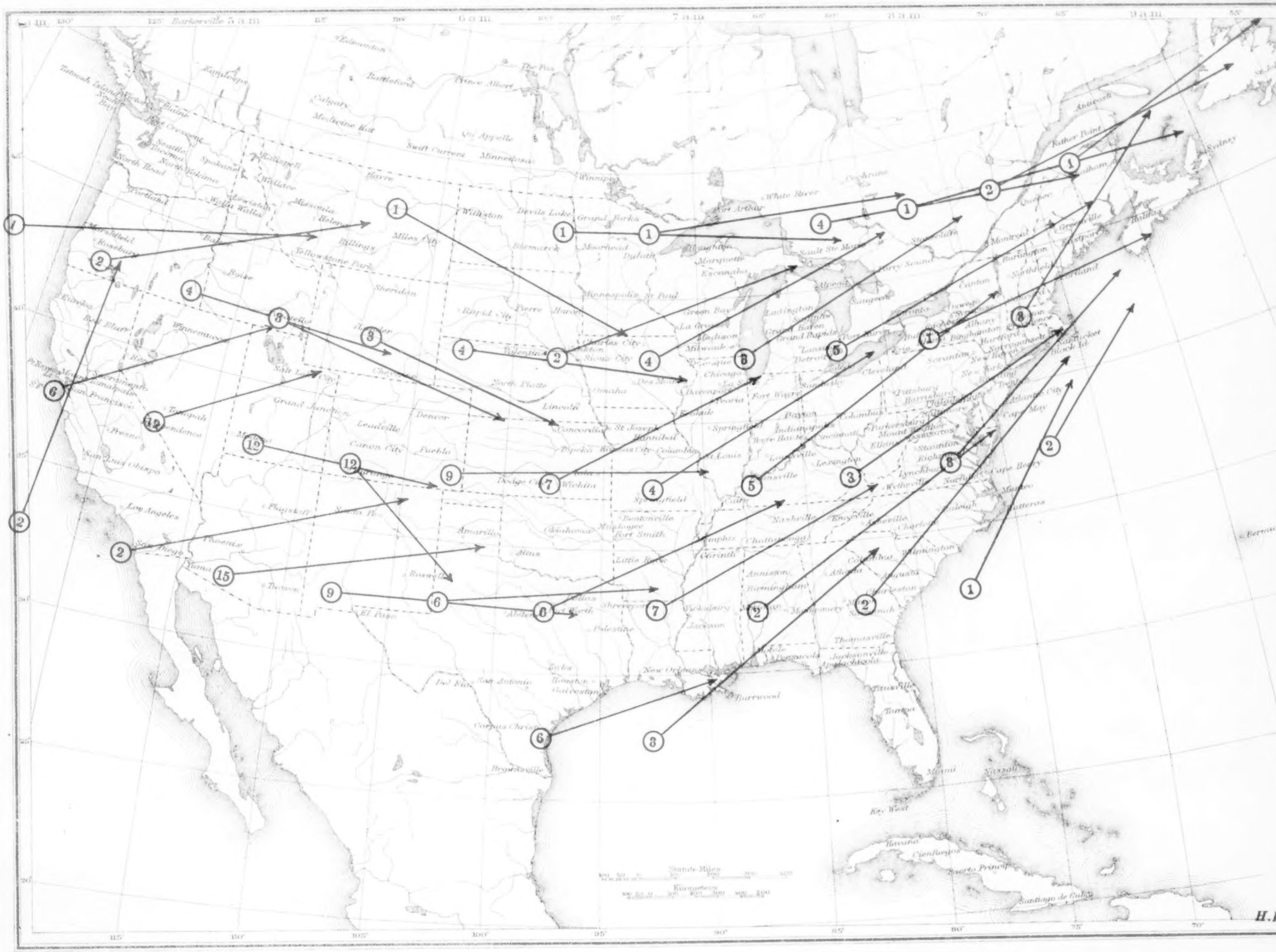


Chart 23.—Average 24-hour movement of storms, by 5°-squares. March—Northern Rocky Mountain type.

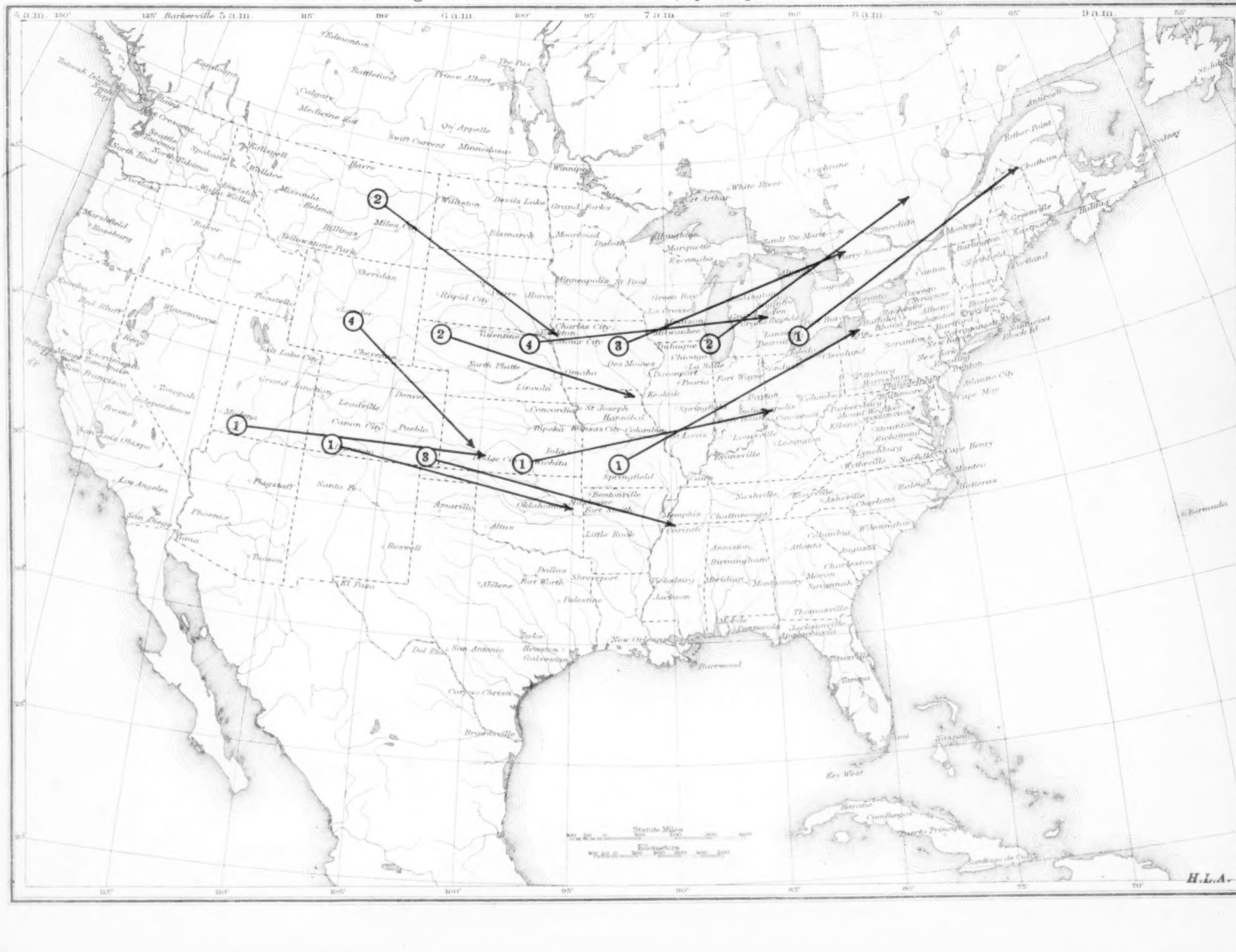


Chart 24.—Average 24-hour movement of storms, by 5°-squares.

March—Colorado type.

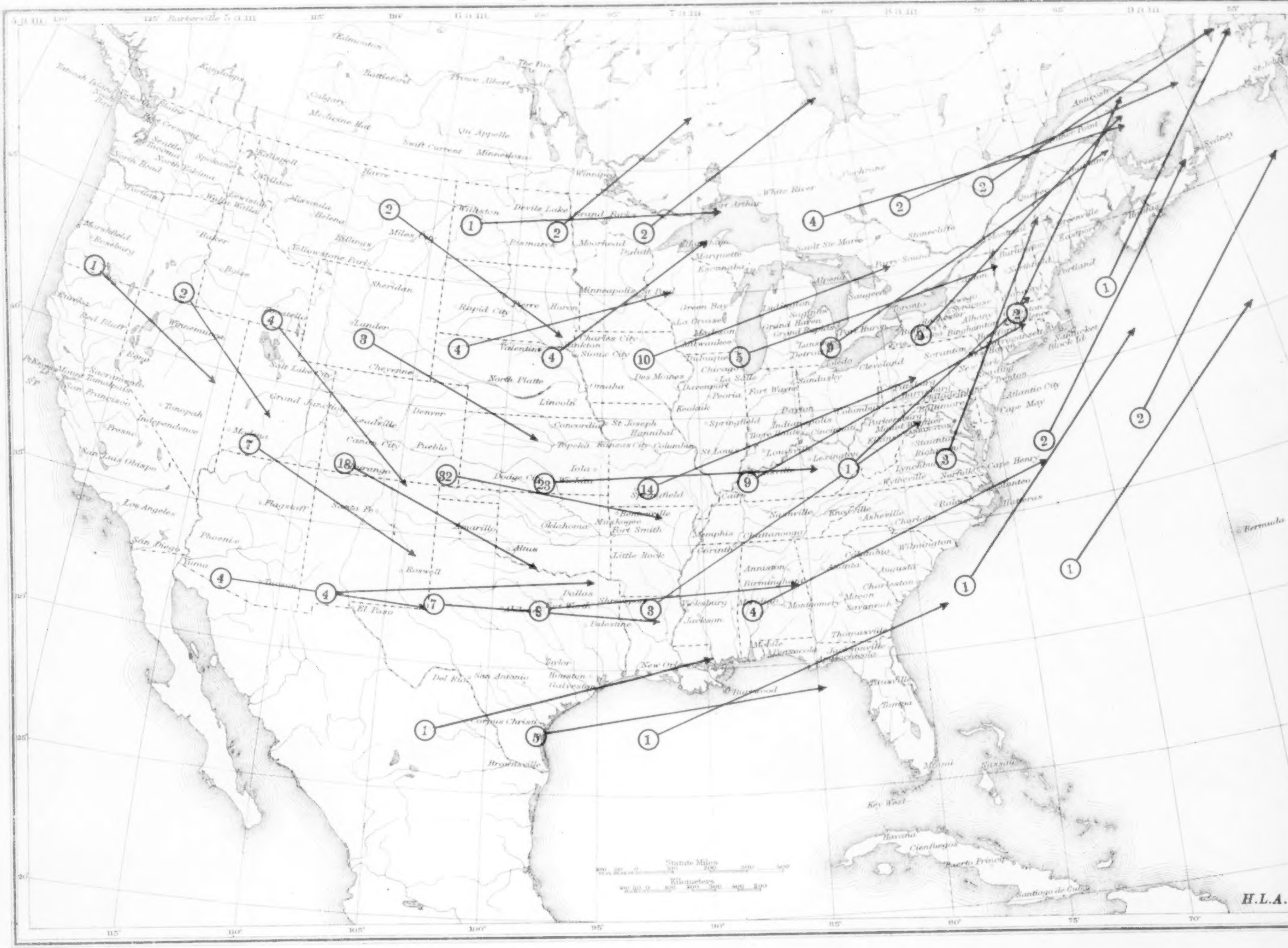


Chart 25.—Average 24-hour movement of storms, by 5°-squares.

March—Texas type.

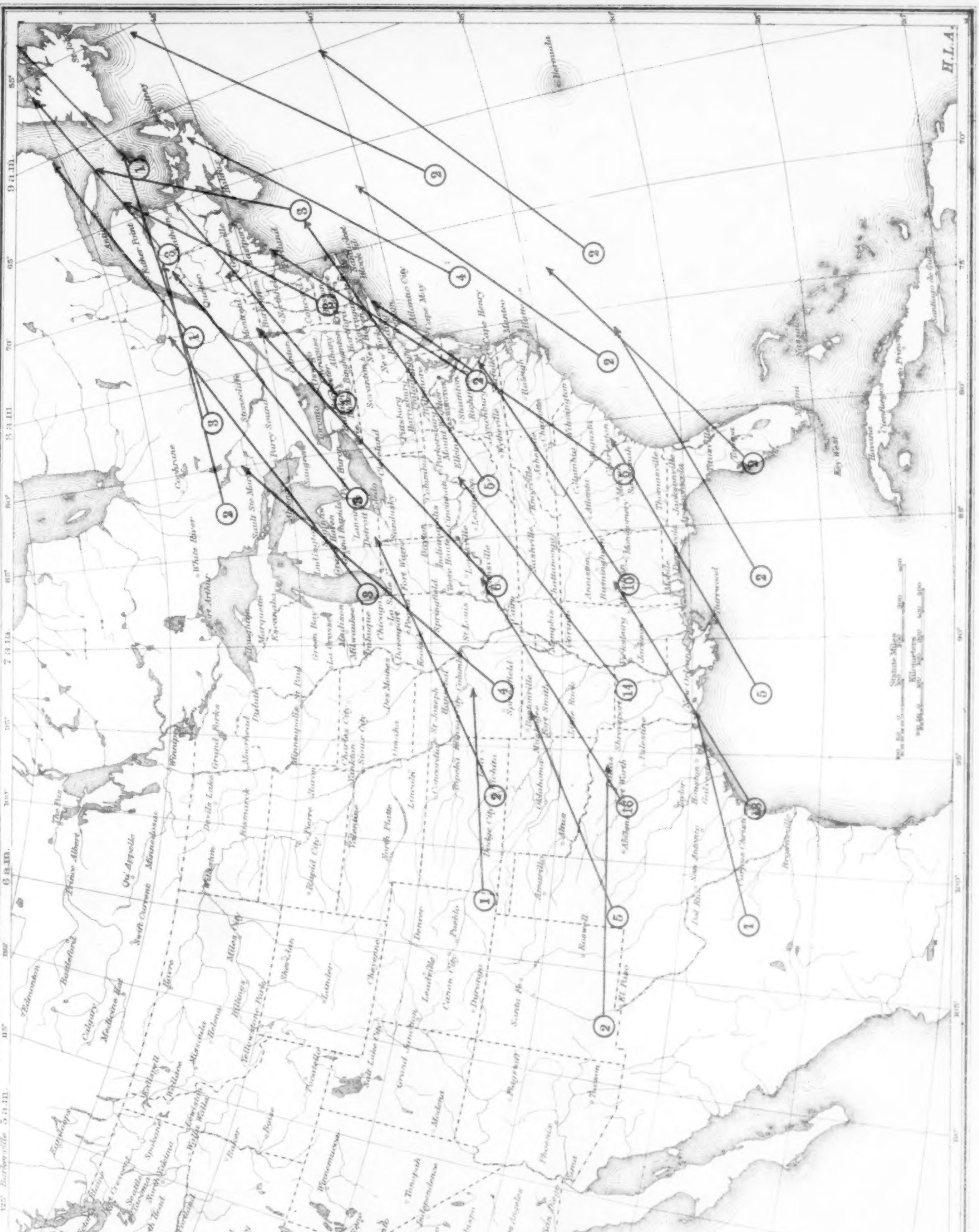
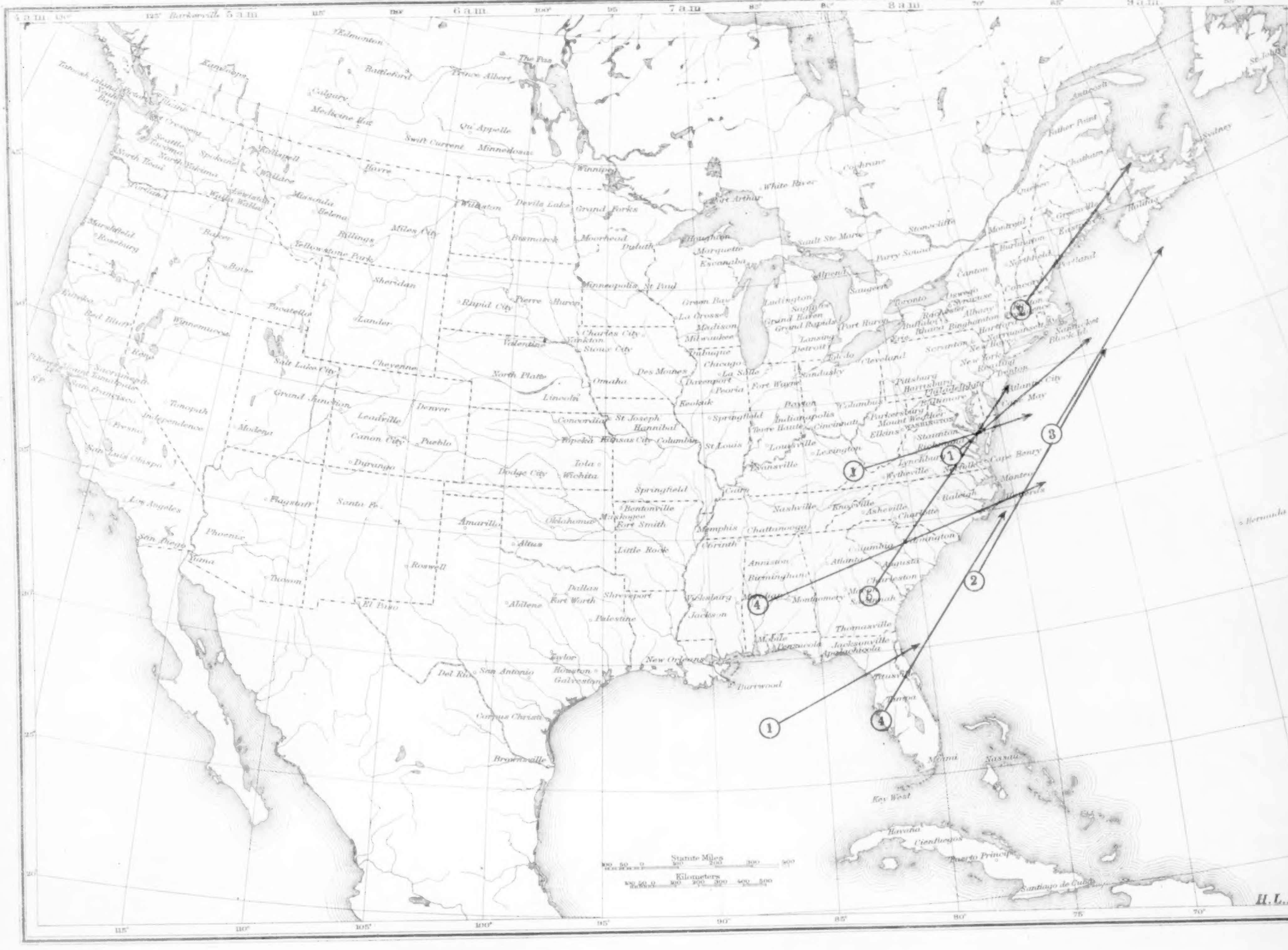


Chart 26.—Average 24-hour movement of storms, by 5°-squares. March—East Gulf type.



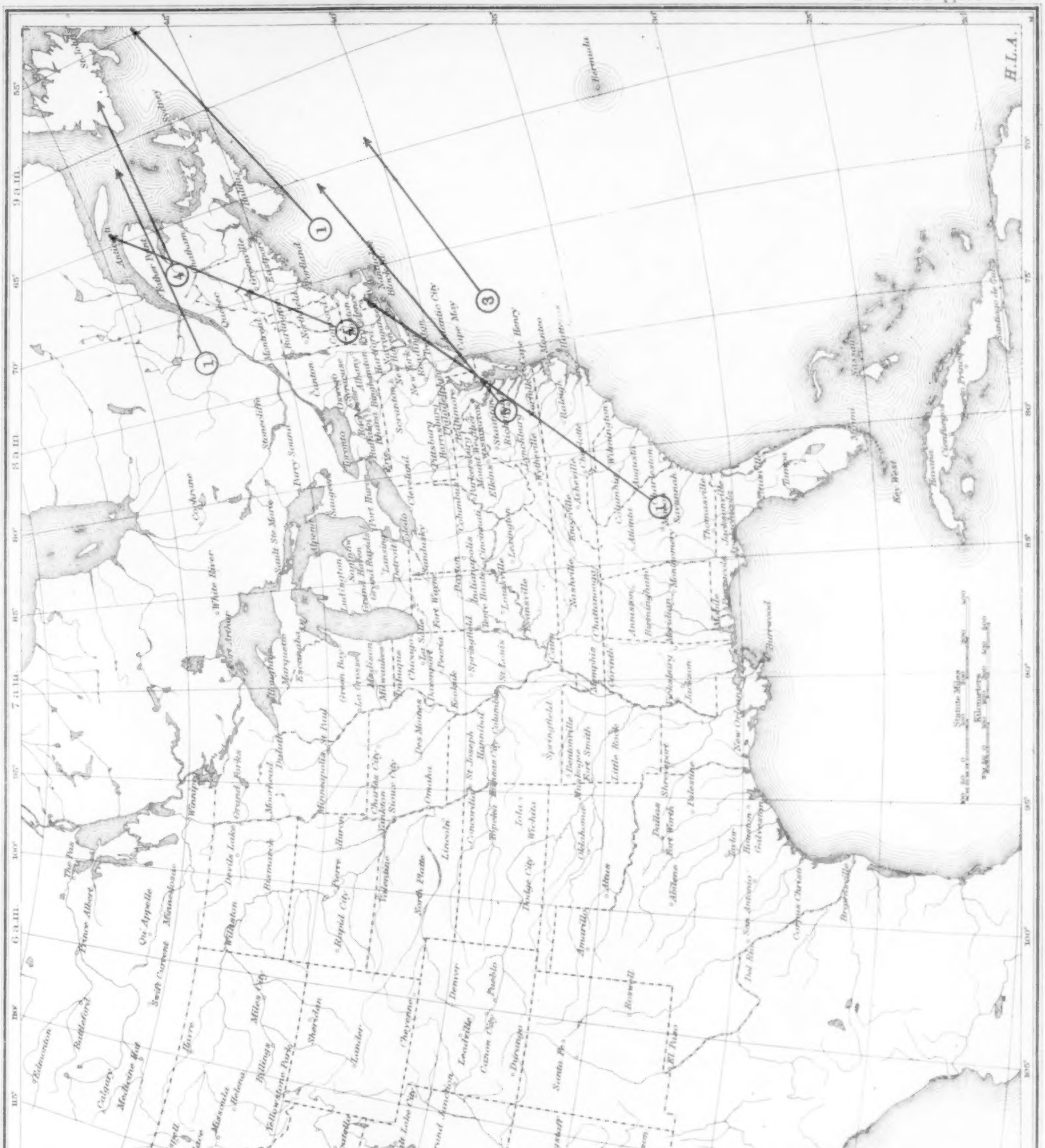


Chart 27.—Average 24-hour movement of storms, by 5°-squares.

March—South Atlantic type.

Chart 28.—Average 24-hour movement of storms, by 5°-squares.

March—Central type.

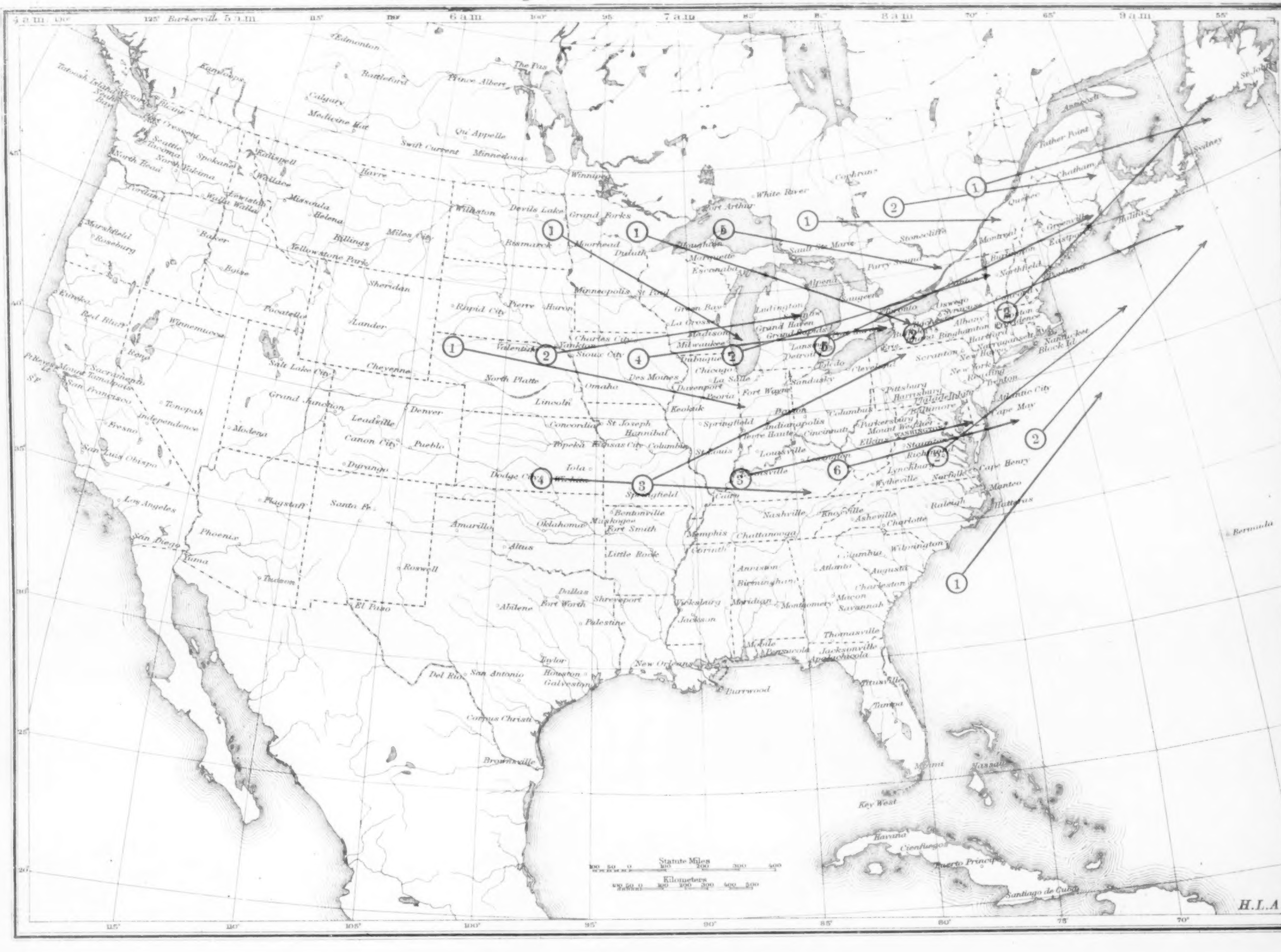


Chart 29.—Average 24-hour movement of storms, by 5°-squares.

April—Alberta type.

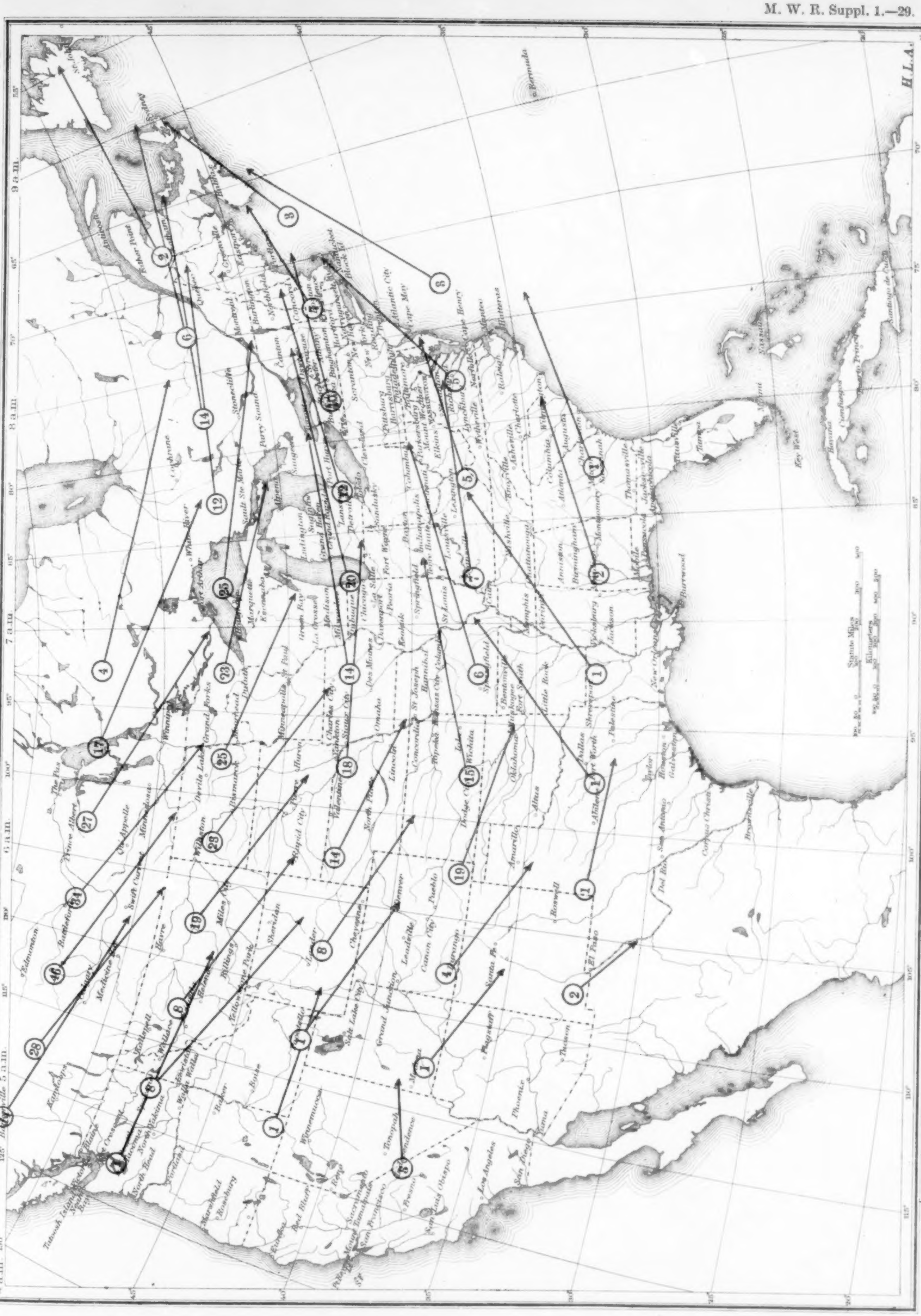


Chart 30.—Average 24-hour movement of storms, by 5°-squares. April—North Pacific type.

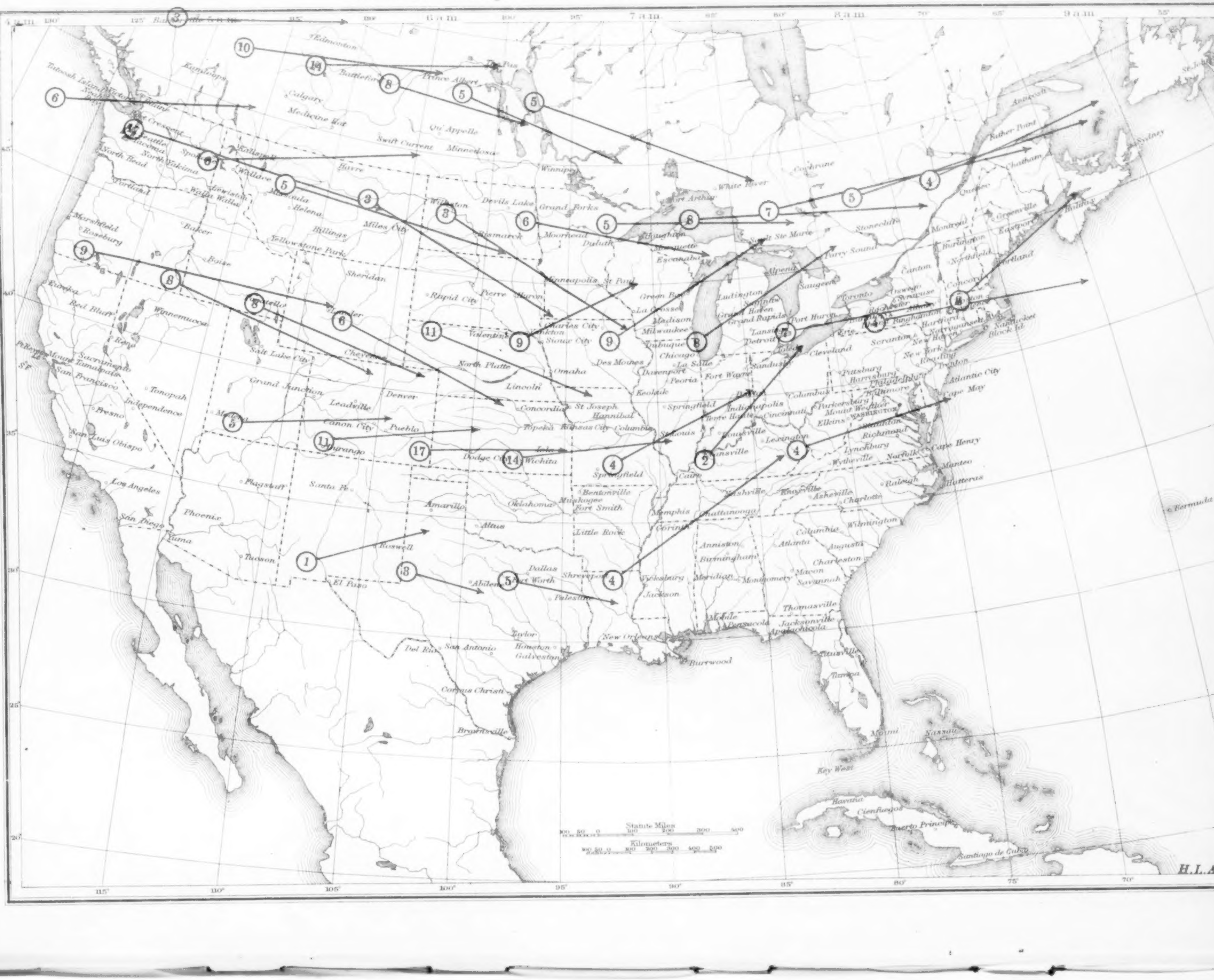
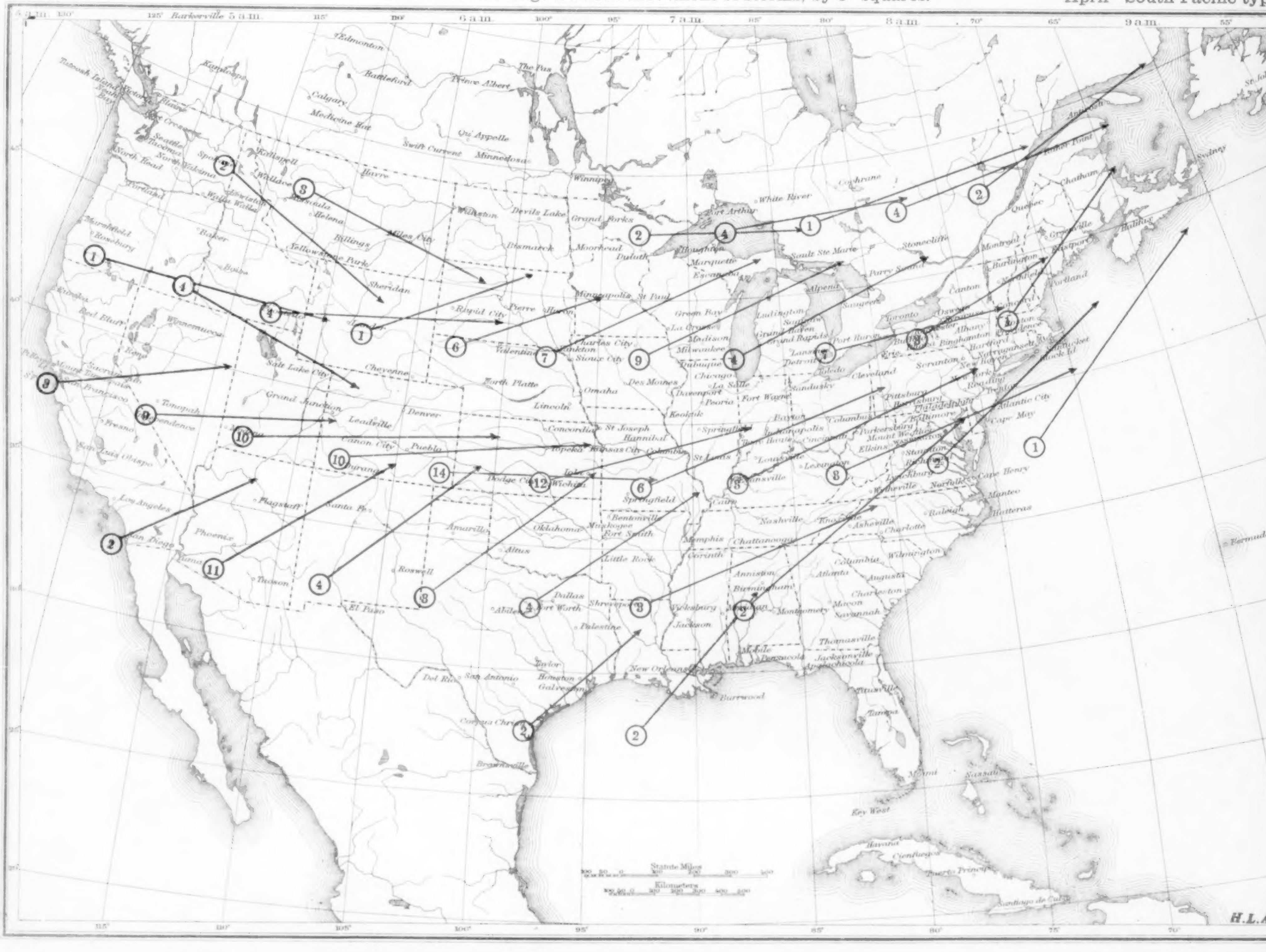


Chart 31.—Average 24-hour movement of storms, by 5°-squares. April—South Pacific type.



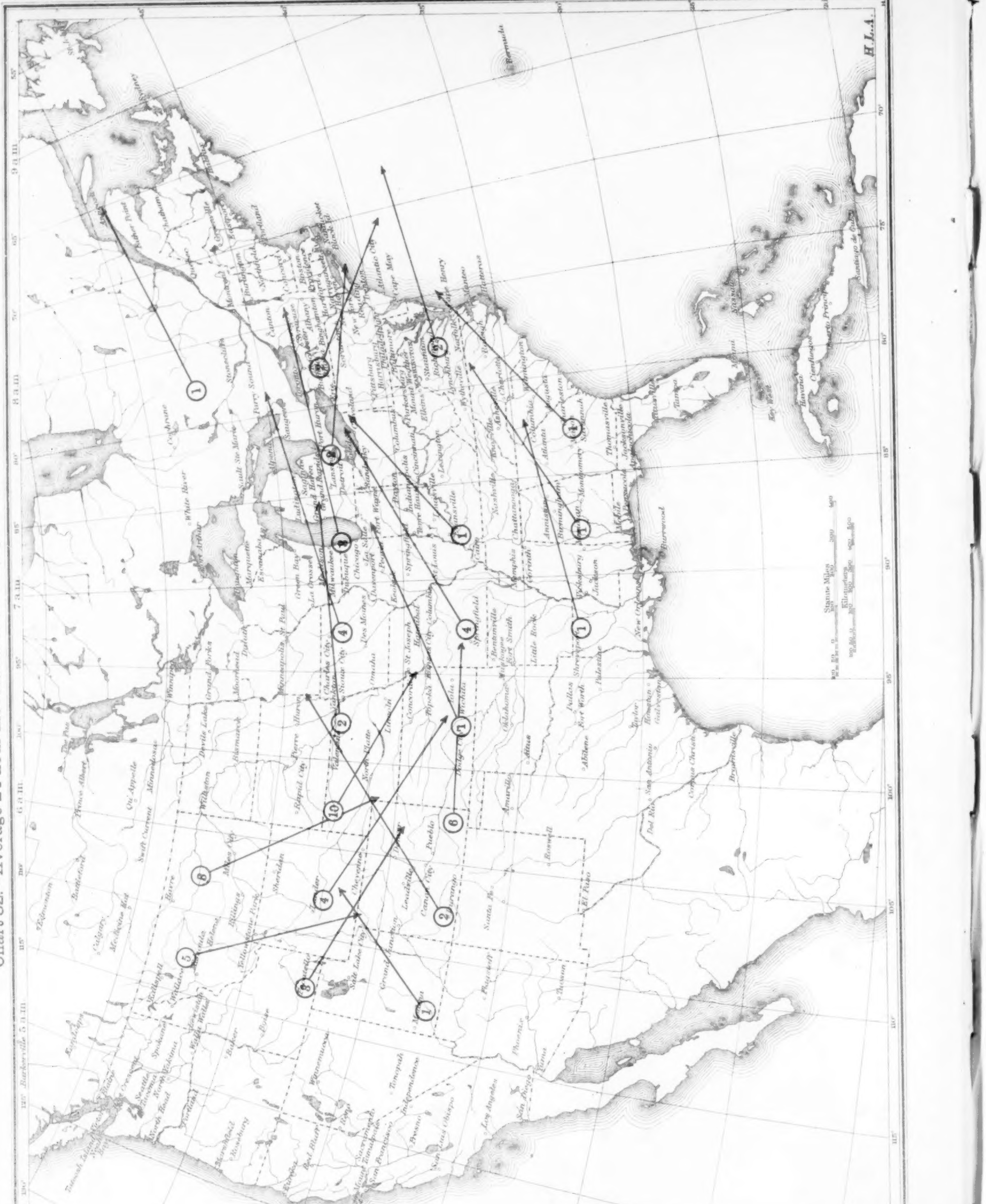
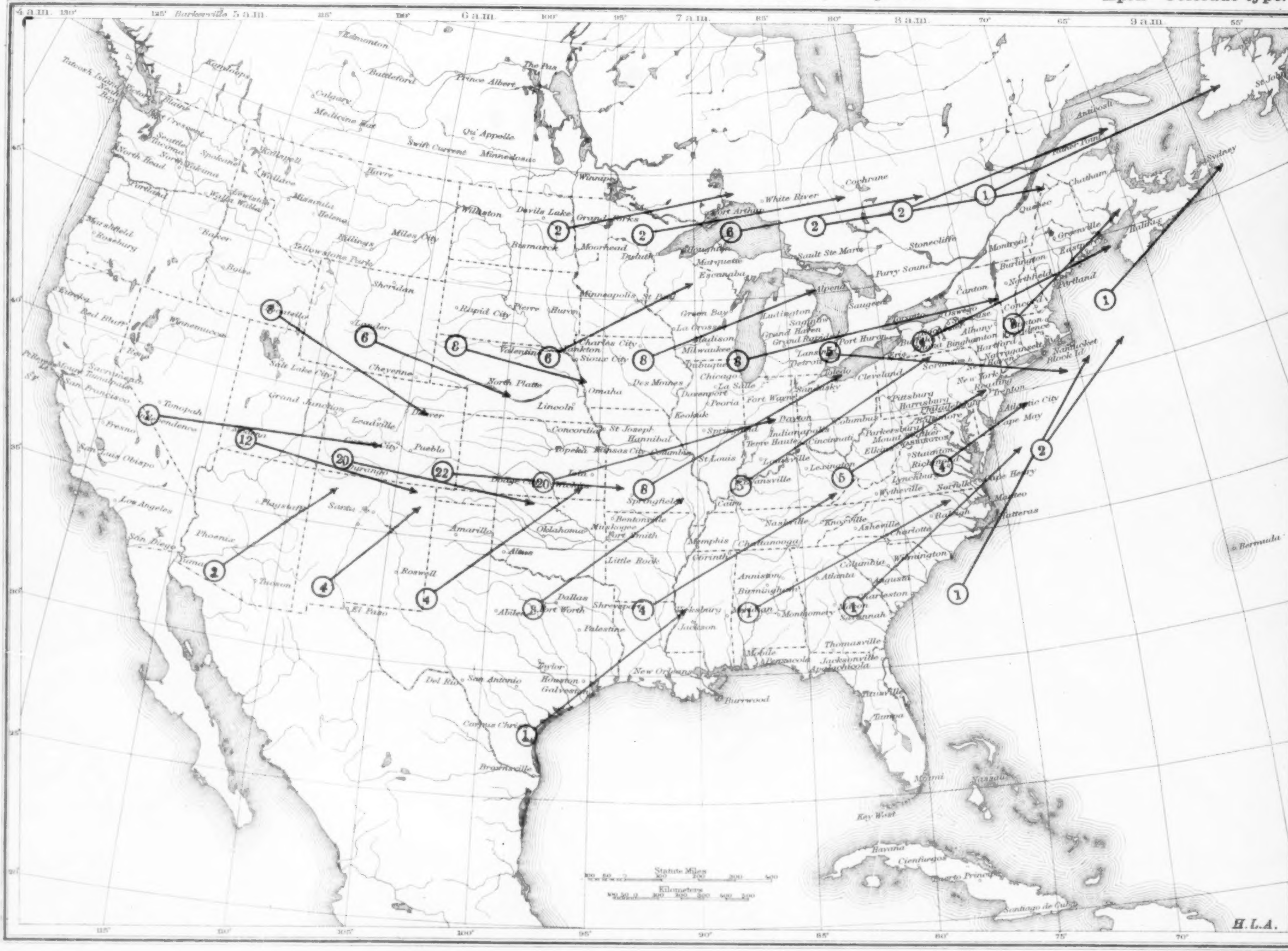


Chart 32.—Average 24-hour movement of storms, by 5°-squares. April—Northern Rocky Mountain type.

Chart 33.—Average 24-hour movement of storms, by 5°-squares.

April—Colorado type.



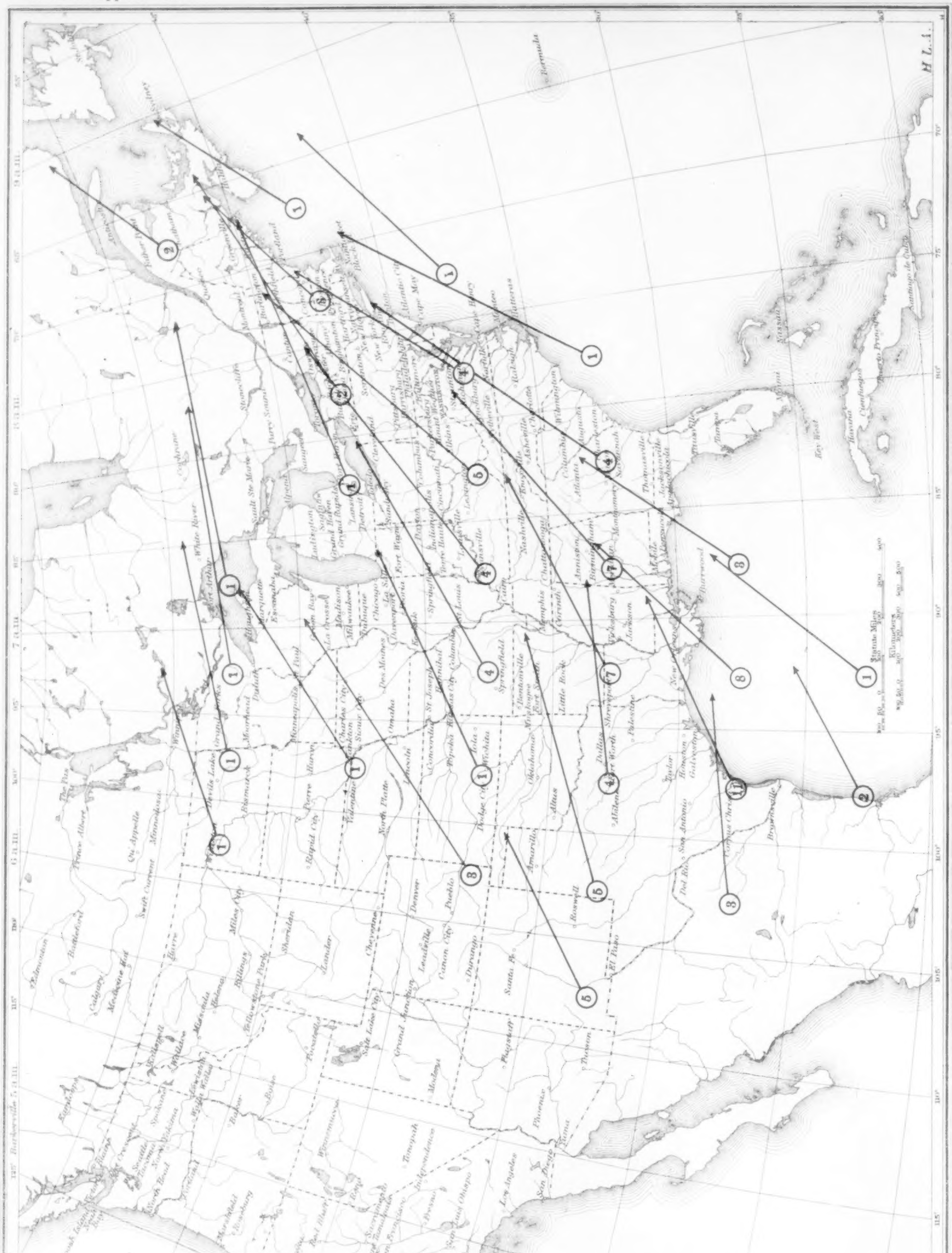


Chart 34.—Average 24-hour movement of storms, by 5°-squares.

April—Texas type.

Chart 35.—Average 24-hour movement of storms, by 5°-squares.

April—East Gulf type.

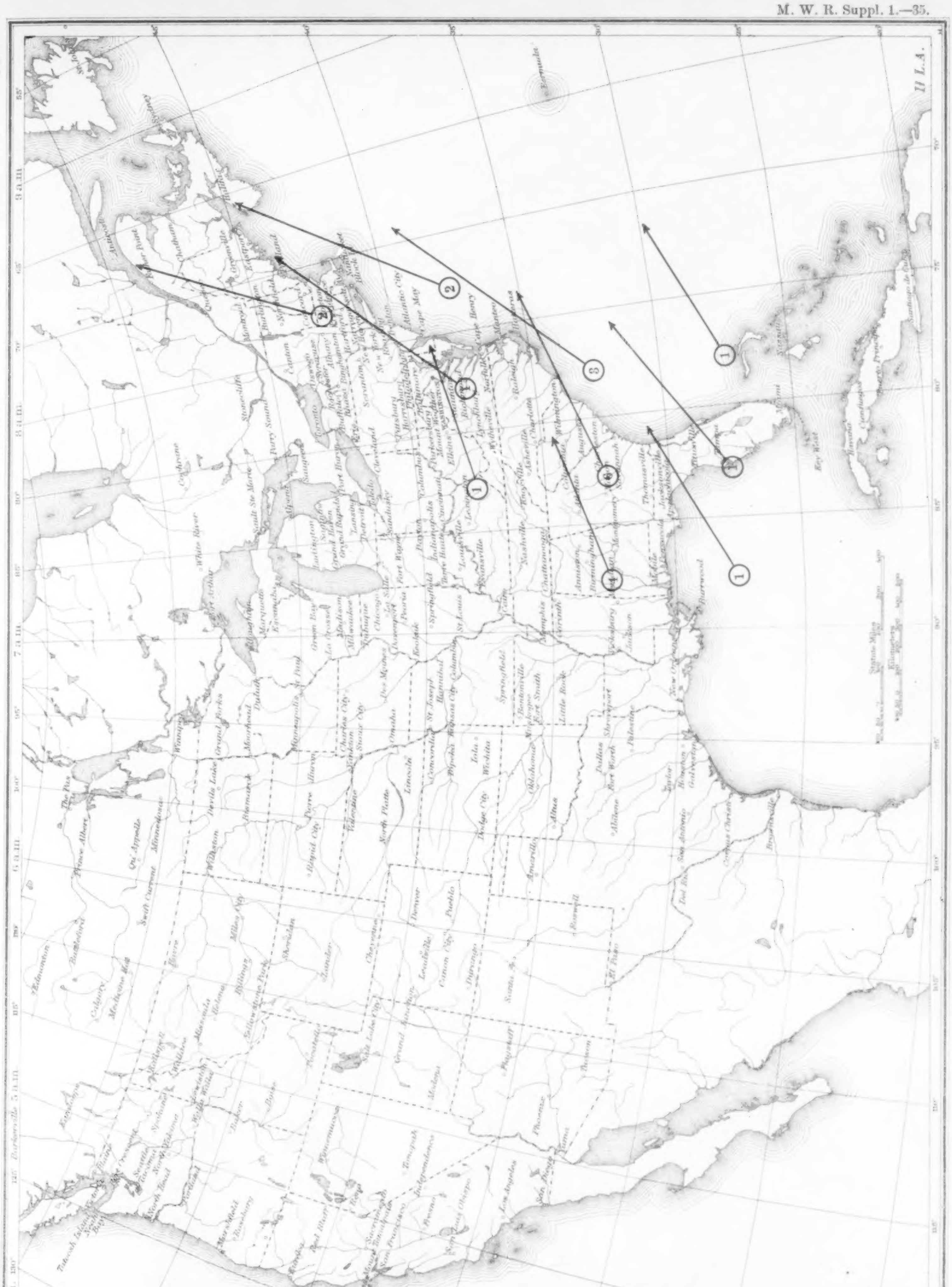


Chart 36.—Average 24-hour movement of storms, by 5°-squares. April—South Atlantic type.

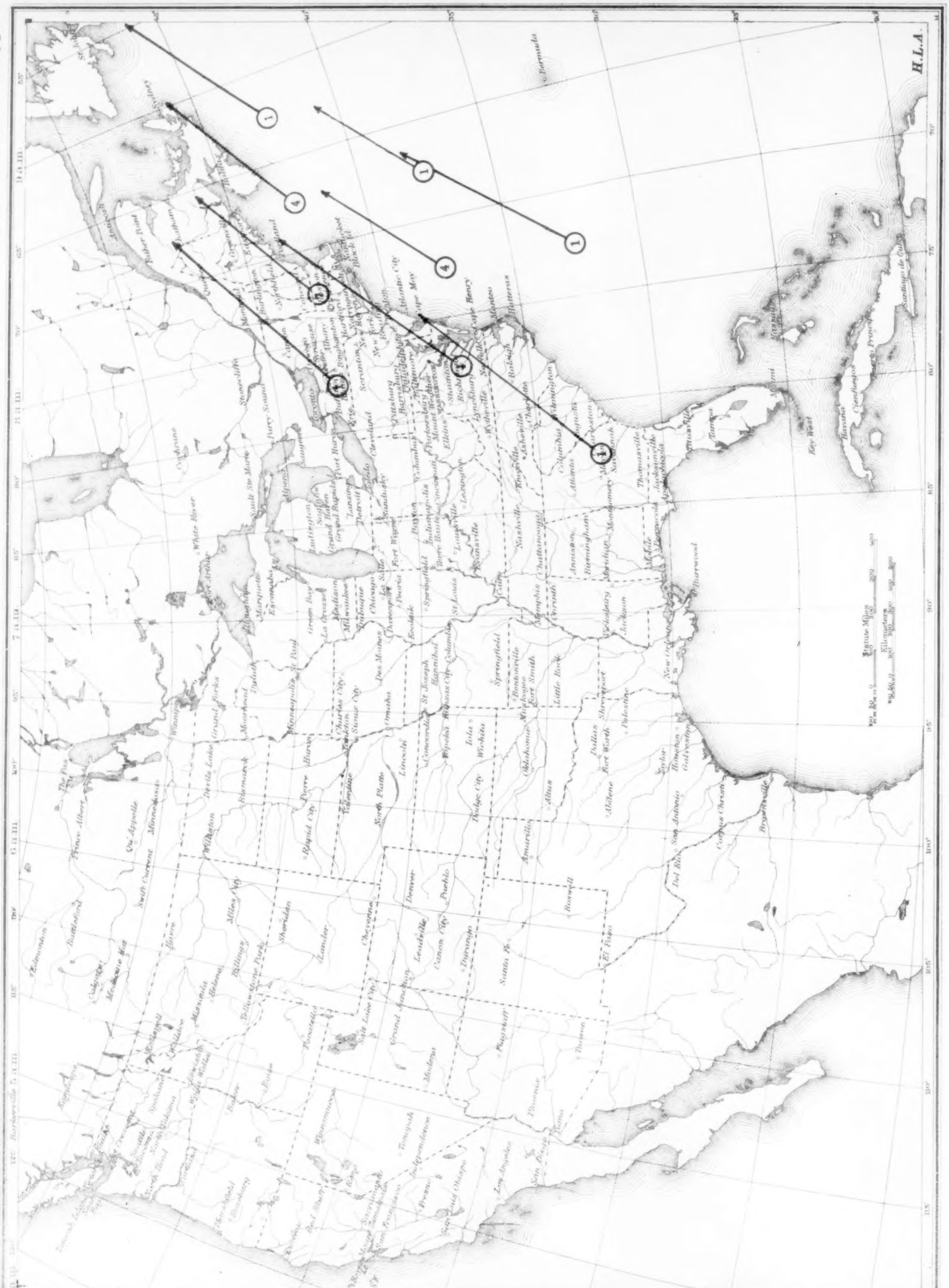


Chart 37.—Average 24-hour movement of storms, by 5°-squares.

April—Central type.

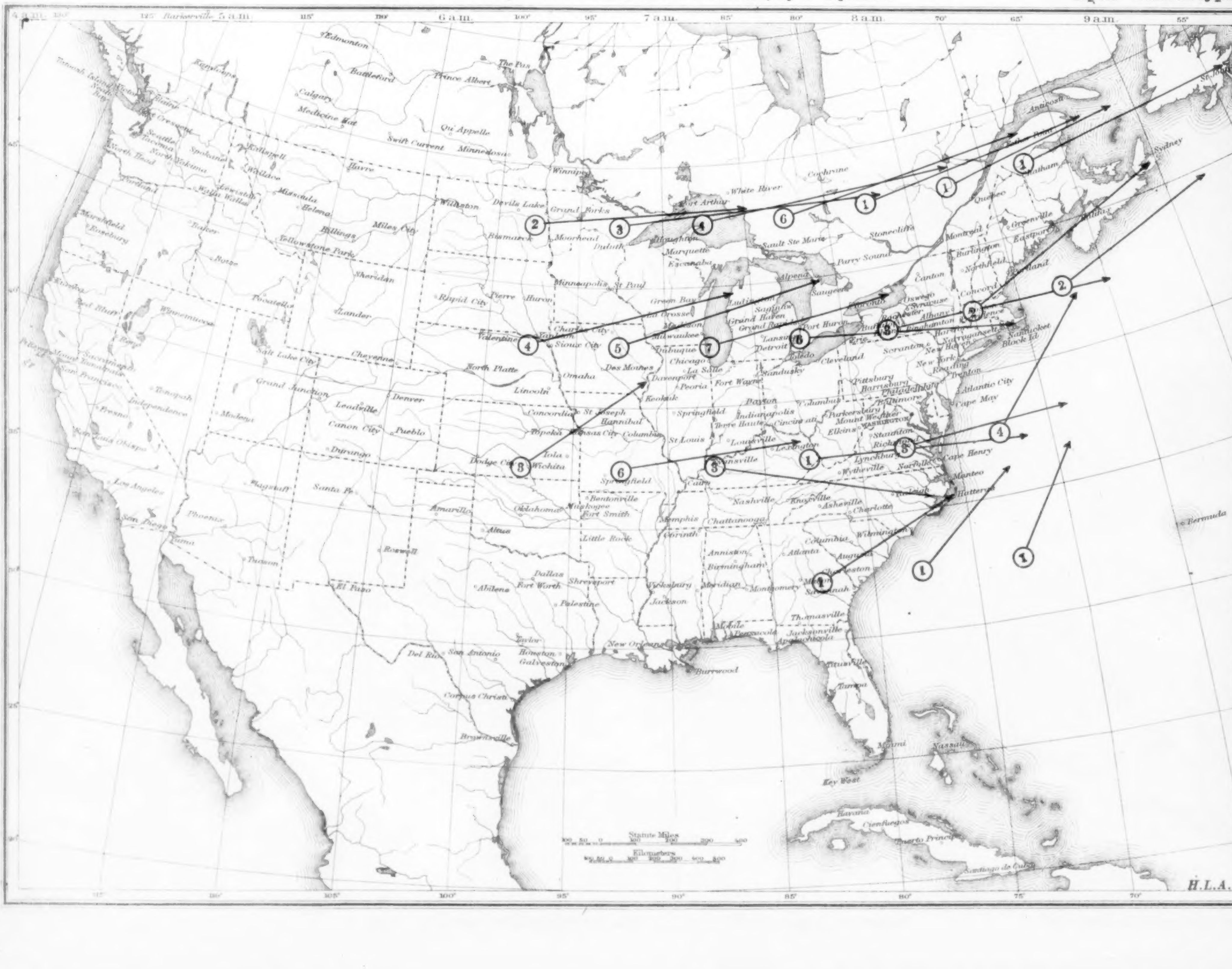


Chart 38.—Average 24-hour movement of storms, by 5°-squares.

May—Alberta type.

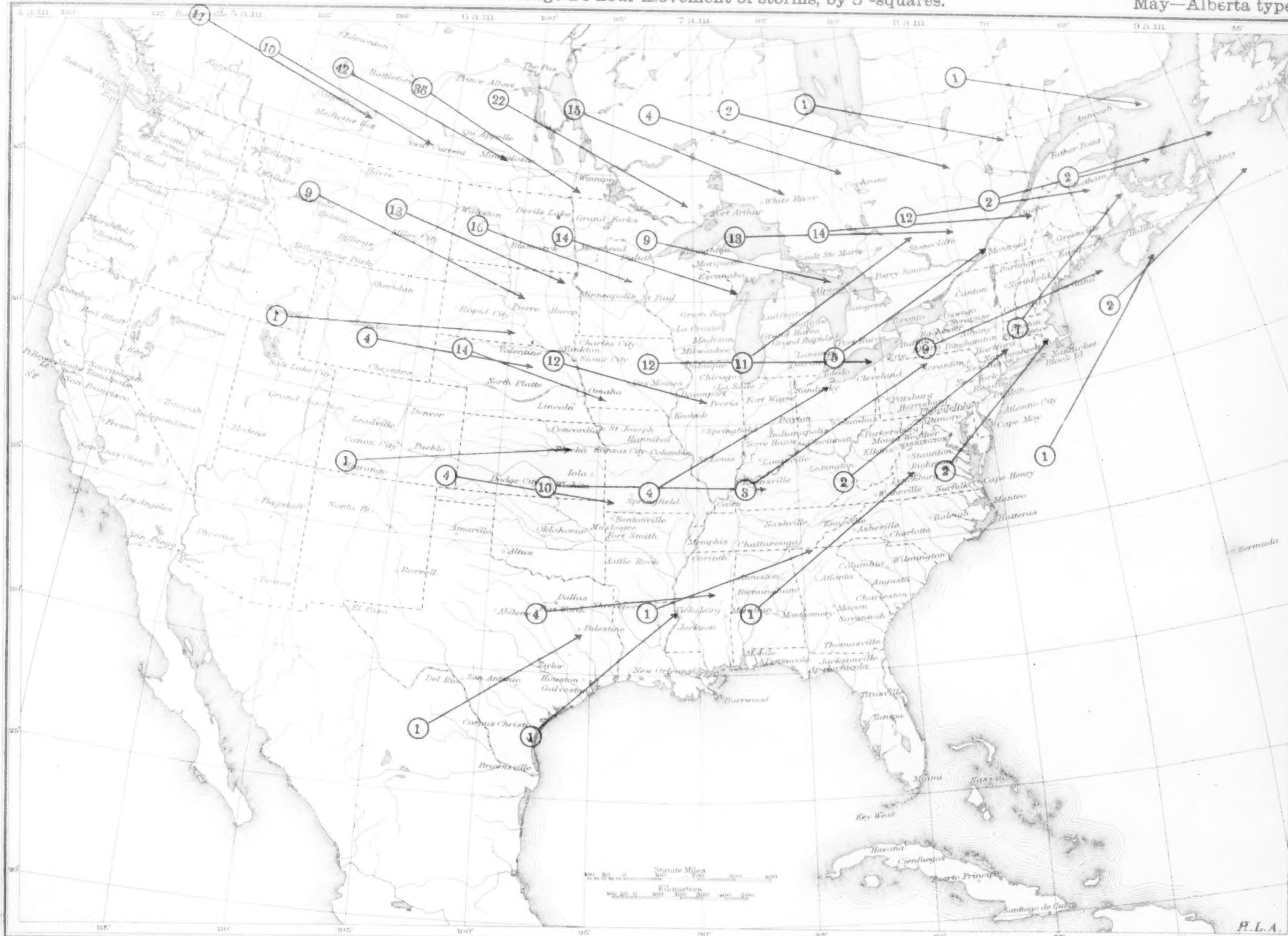


Chart 39.—Average 24-hour movement of storms, by 5°-squares.

May—North Pacific type.

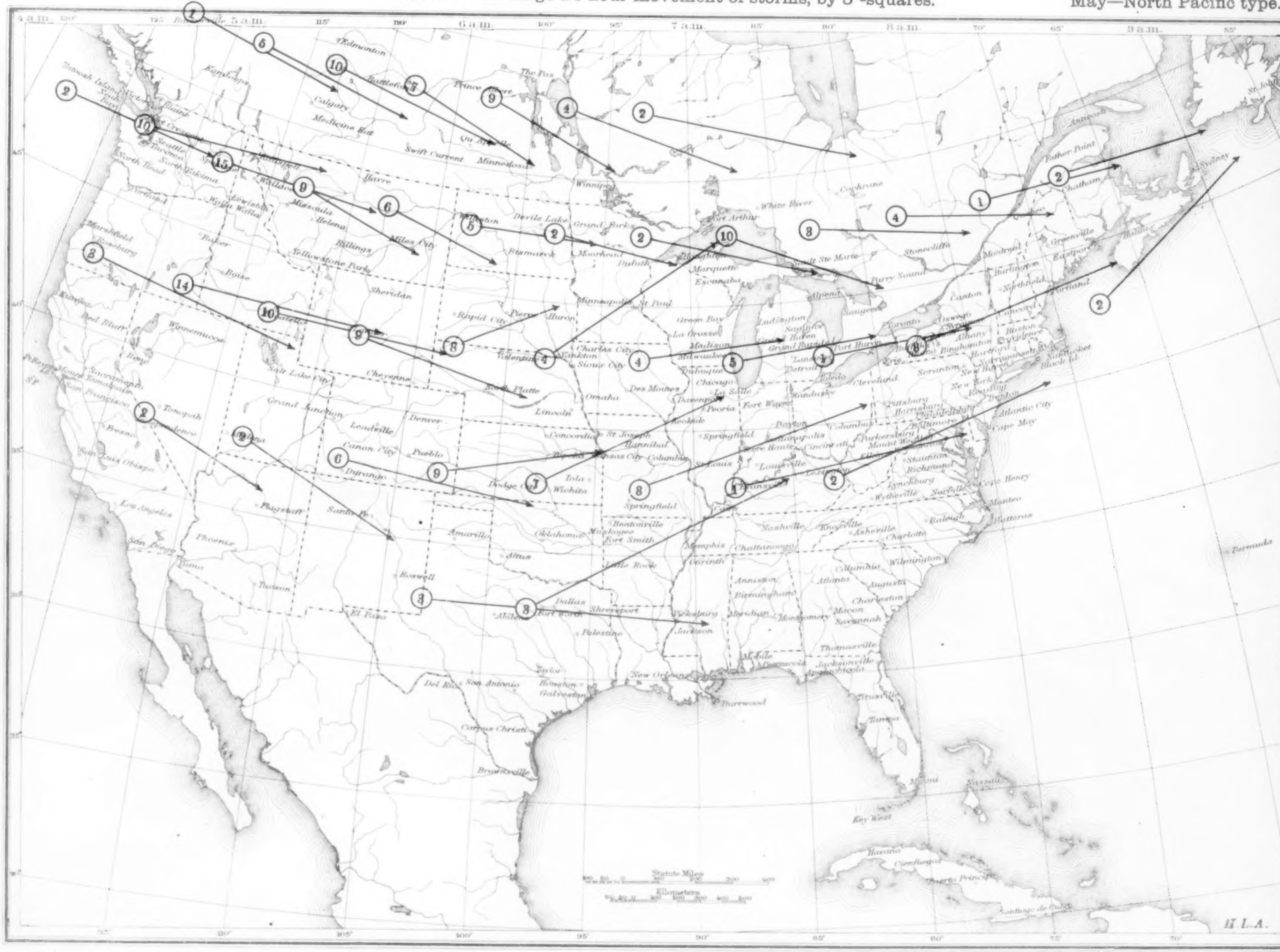


Chart 40.—Average 24-hour movement of storms, by 5°-squares. May—South Pacific type.

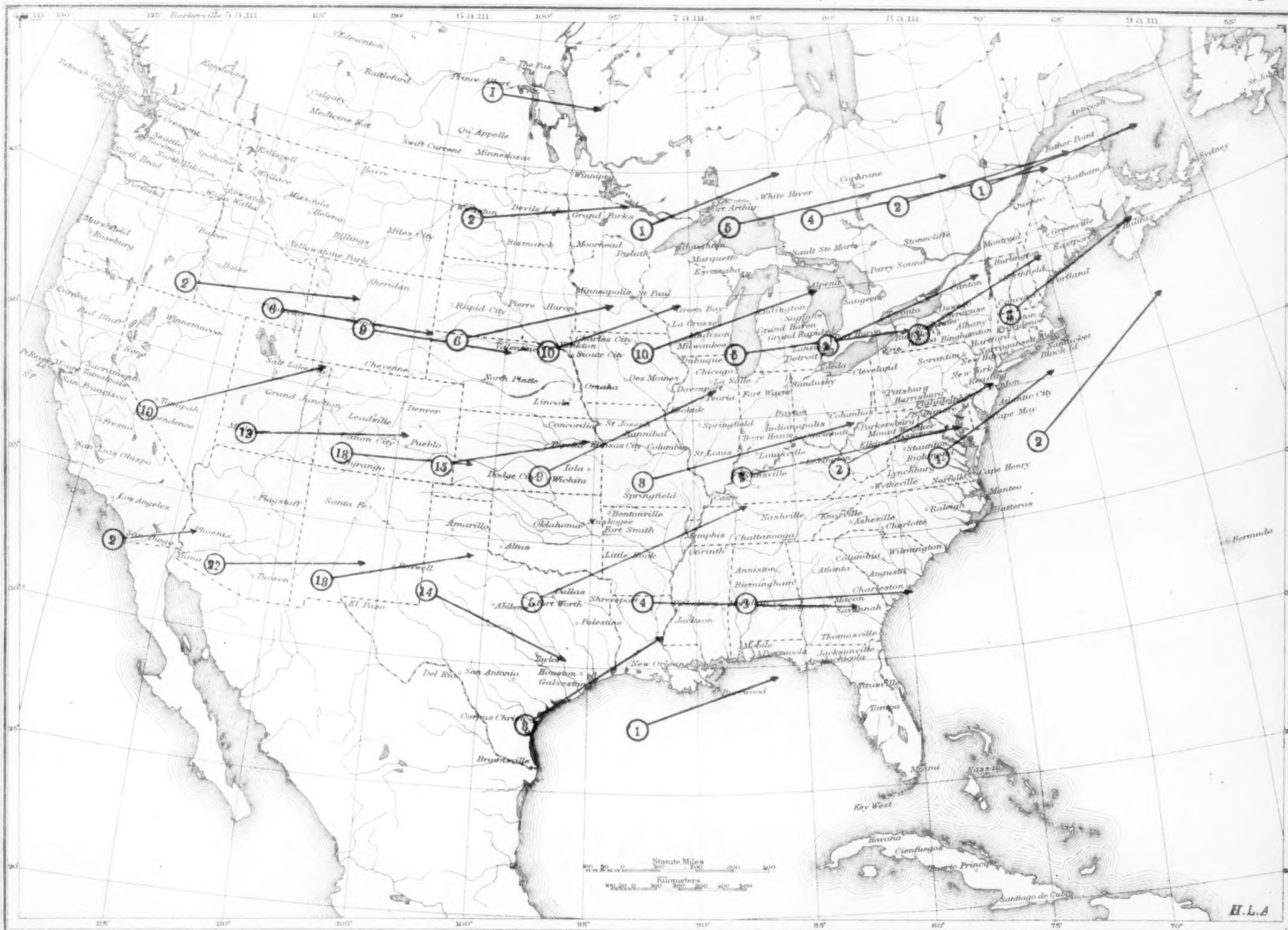


Chart 41.—Average 24-hour movement of storms, by 5°-squares.

May—Northern Rocky Mountain type.

Chart 42.—Average 24-hour movement of storms, by 5°-squares.

May—Colorado type.

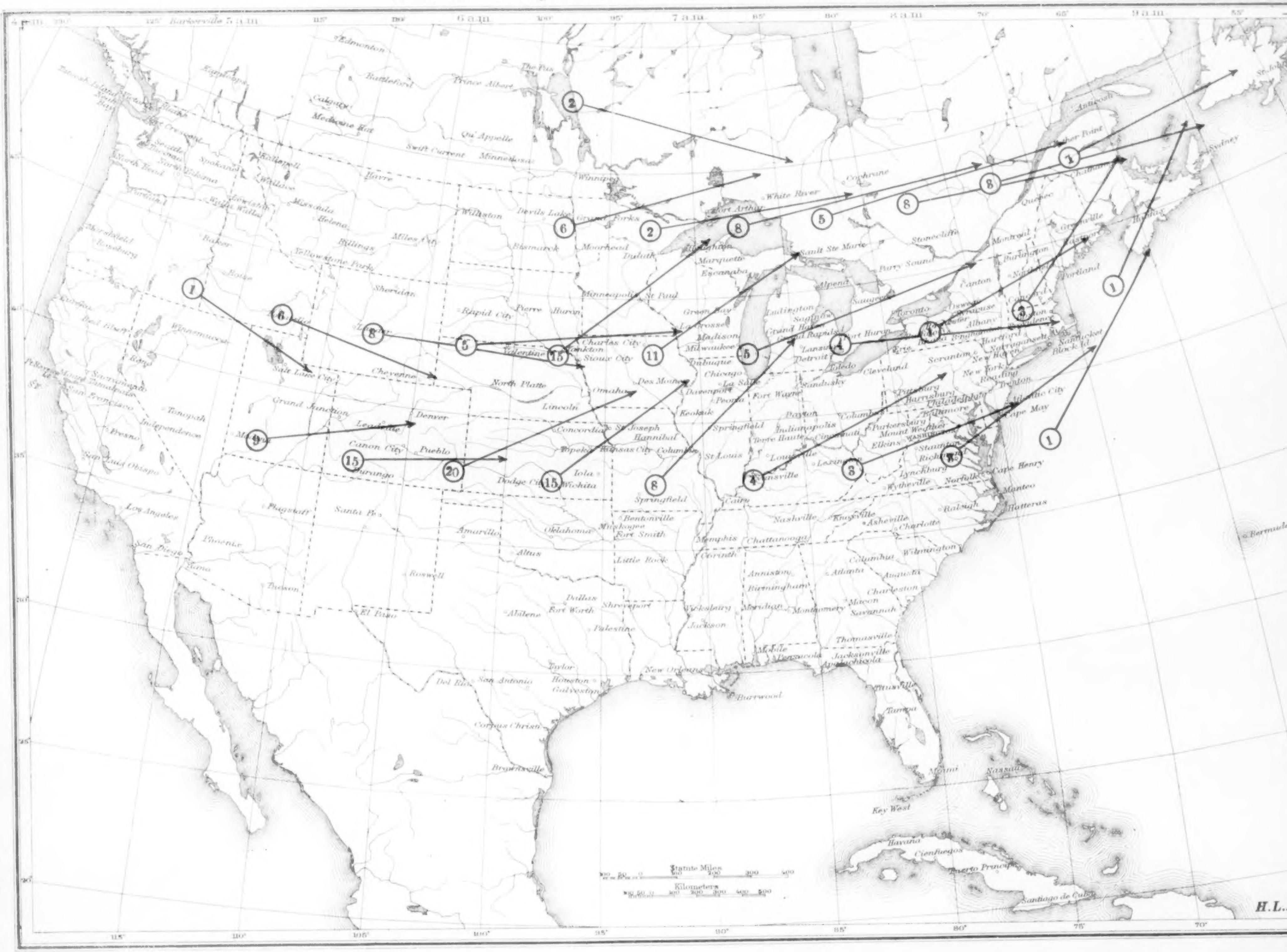


Chart 43.—Average 24-hour movement of storms, by 5° squares.

May—Texas type.

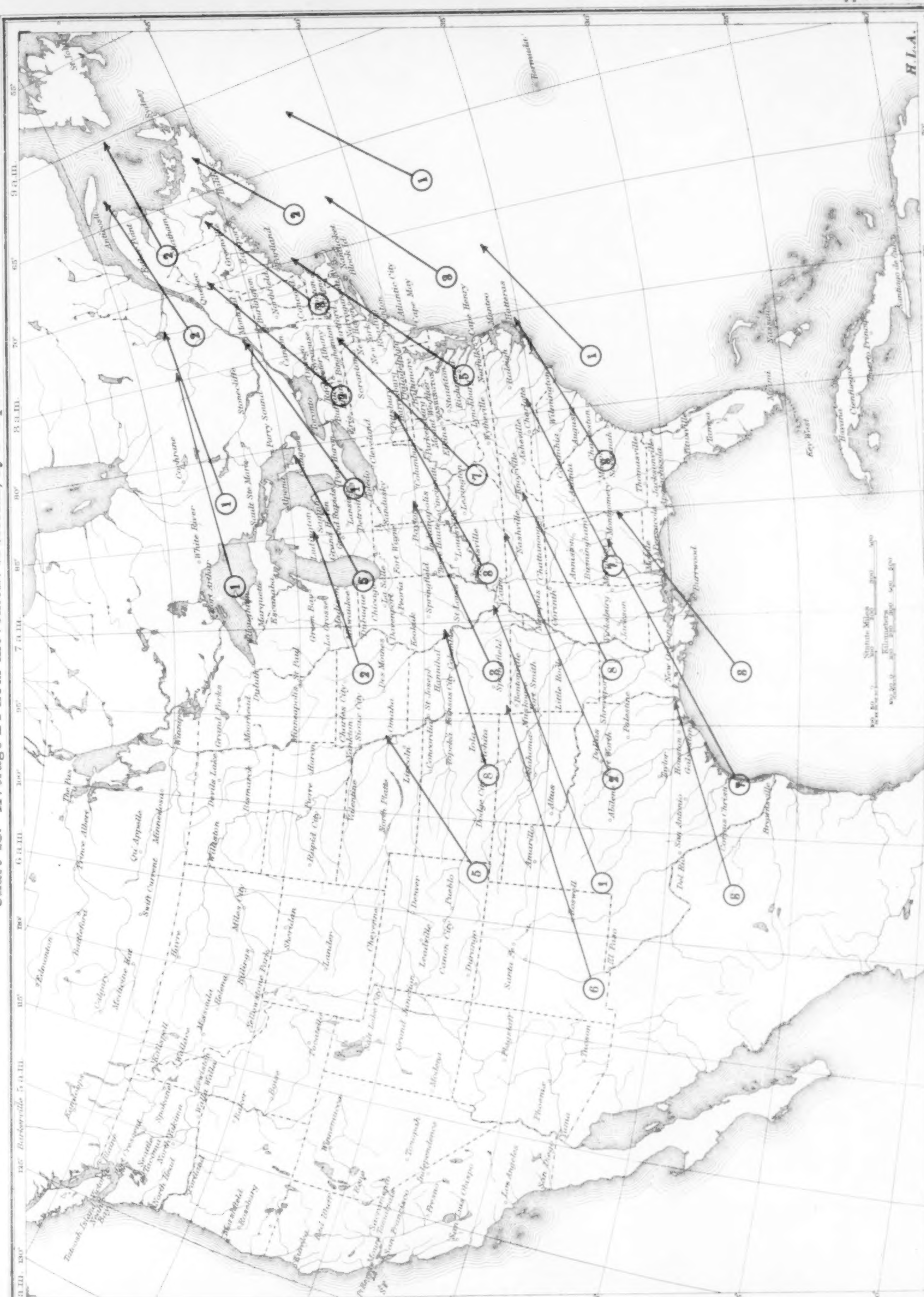


Chart 44.—Average 24-hour movement of storms, by 5°-squares.

May—East Gulf type.

Chart 45.—Average 24-hour movement of storms, by 5°-squares. May—South Atlantic type.

Chart 46.—Average 24-hour movement of storms, by 5°-squares. May—Central type.

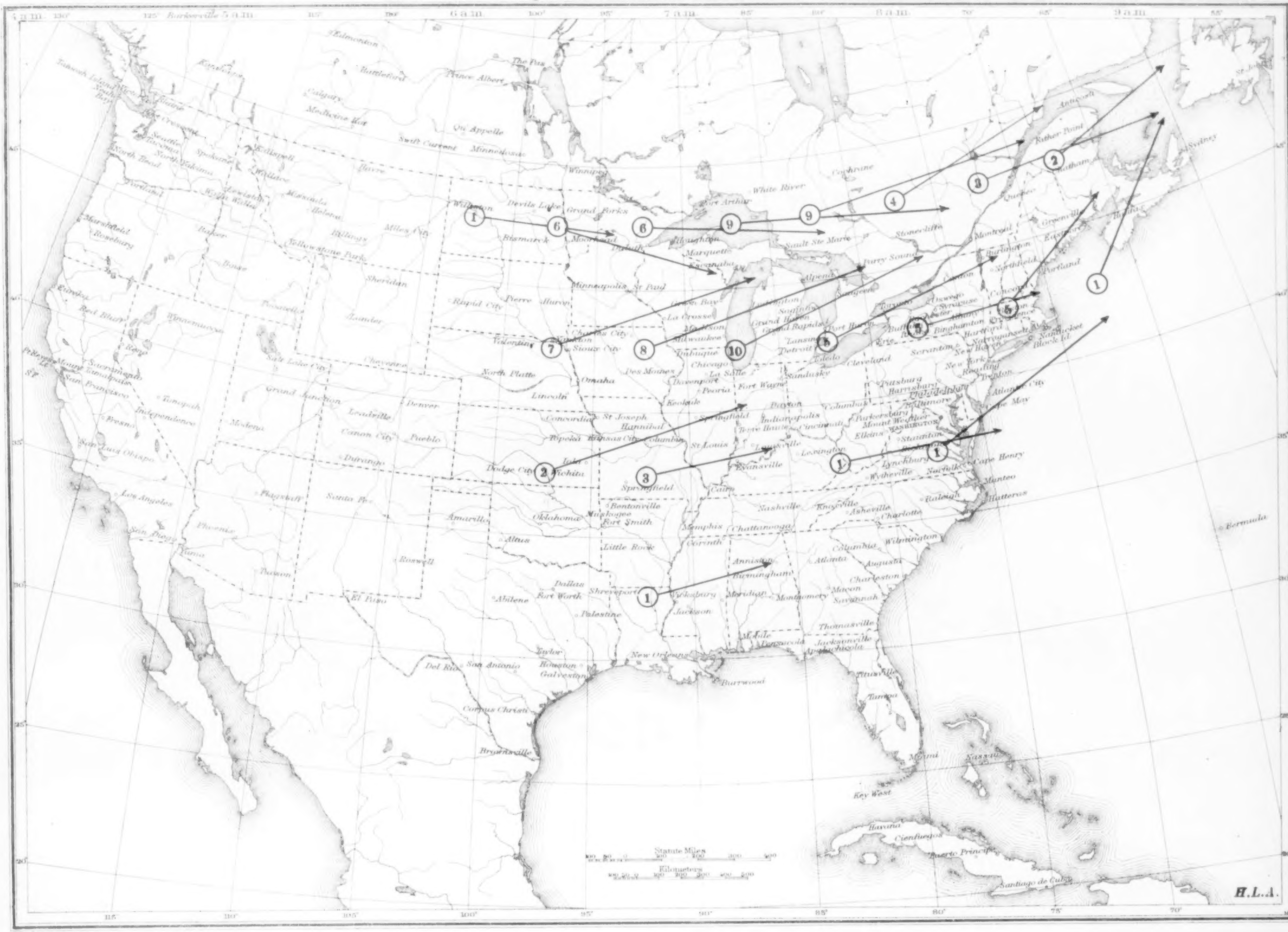


Chart 47.—Average 24-hour movement of storms, by 5°-squares.

June—Alberta type.

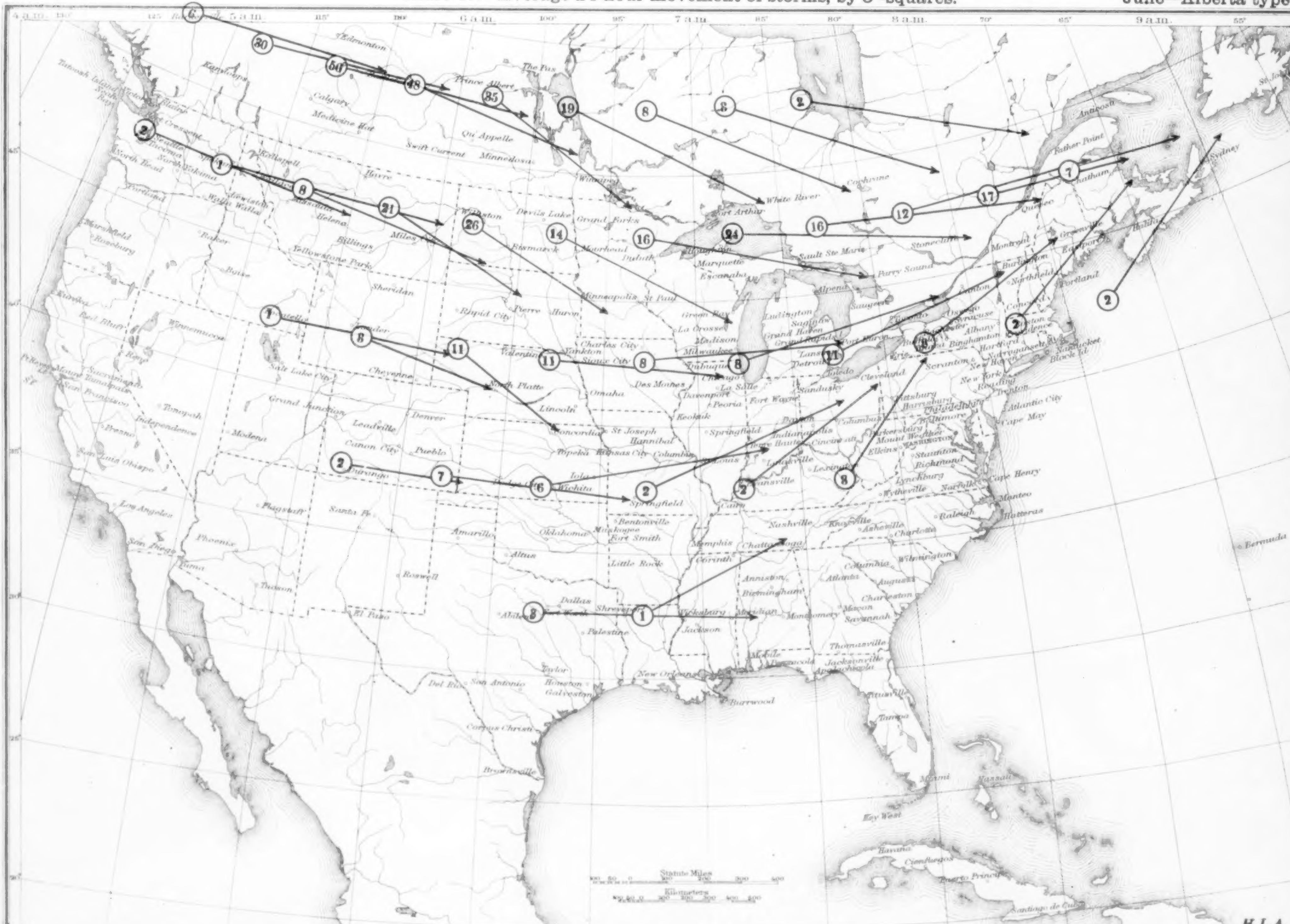
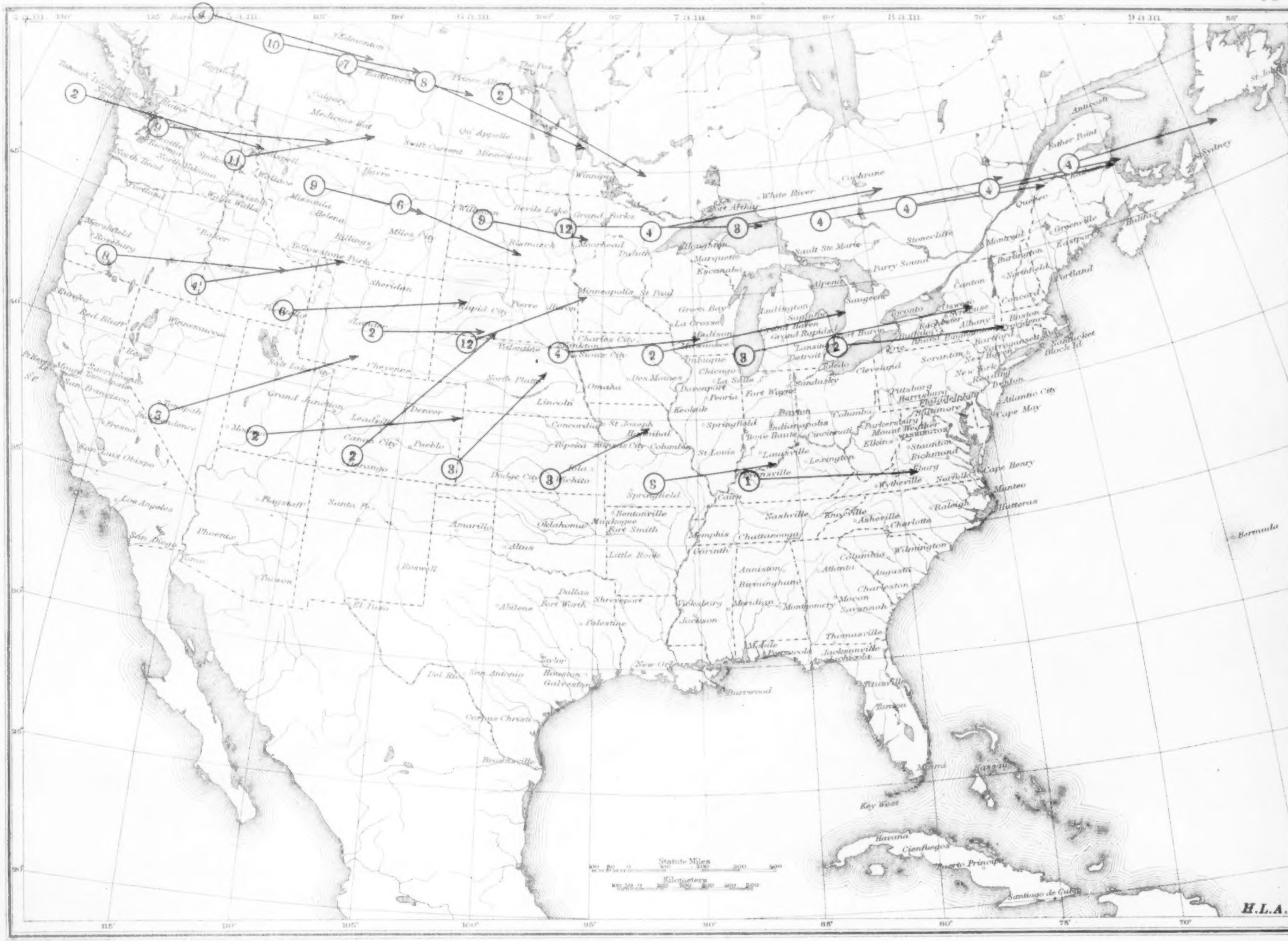


Chart 48.—Average 24-hour movement of storms, by 5°-squares. June—North Pacific type.



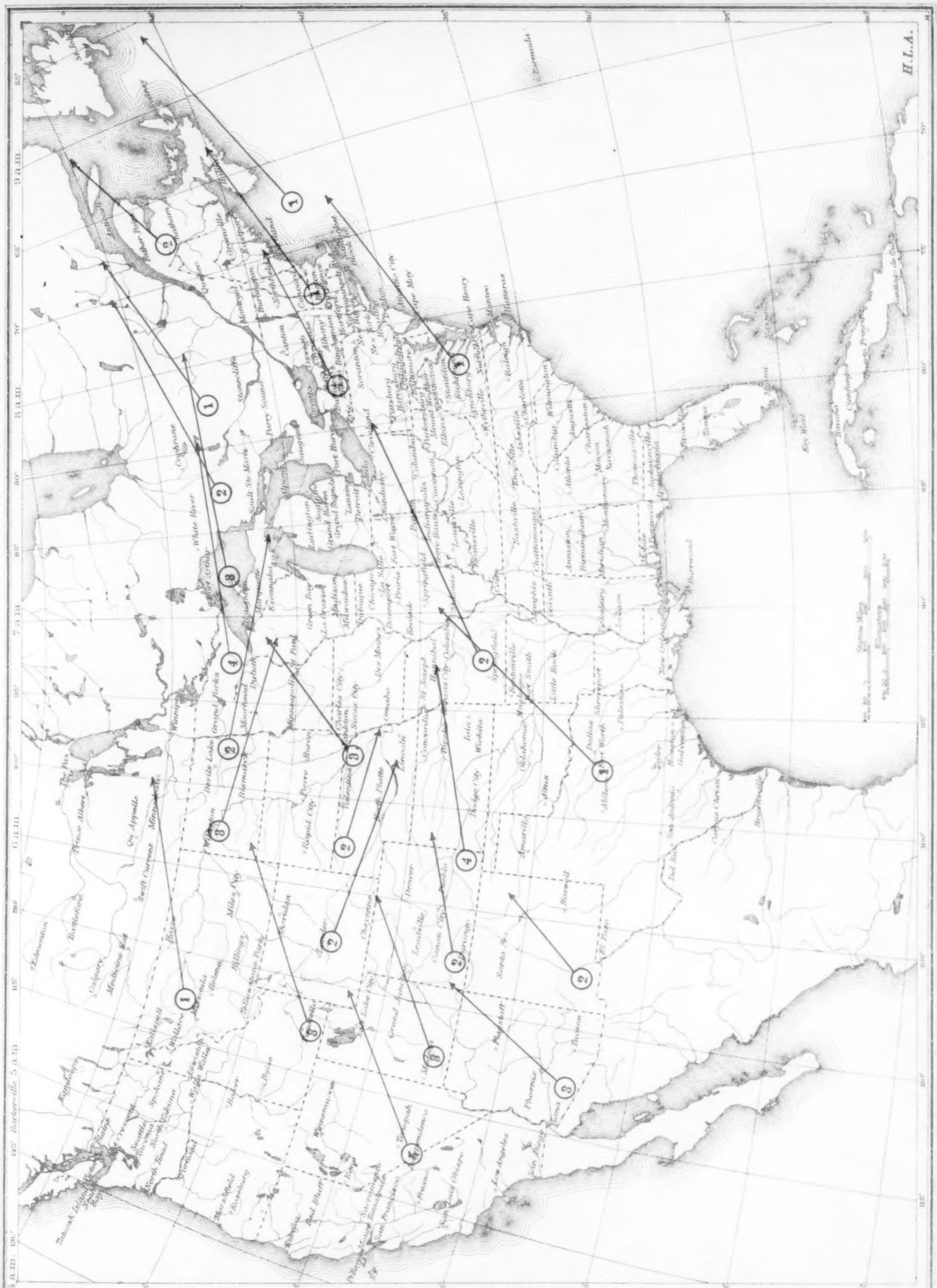


Chart 49.—Average 24-hour movement of storms, by 5°-squares.

June—South Pacific type.

Chart 50.—Average 24-hour movement of storms, by 5°-squares. June—Northern Rocky Mountain type.

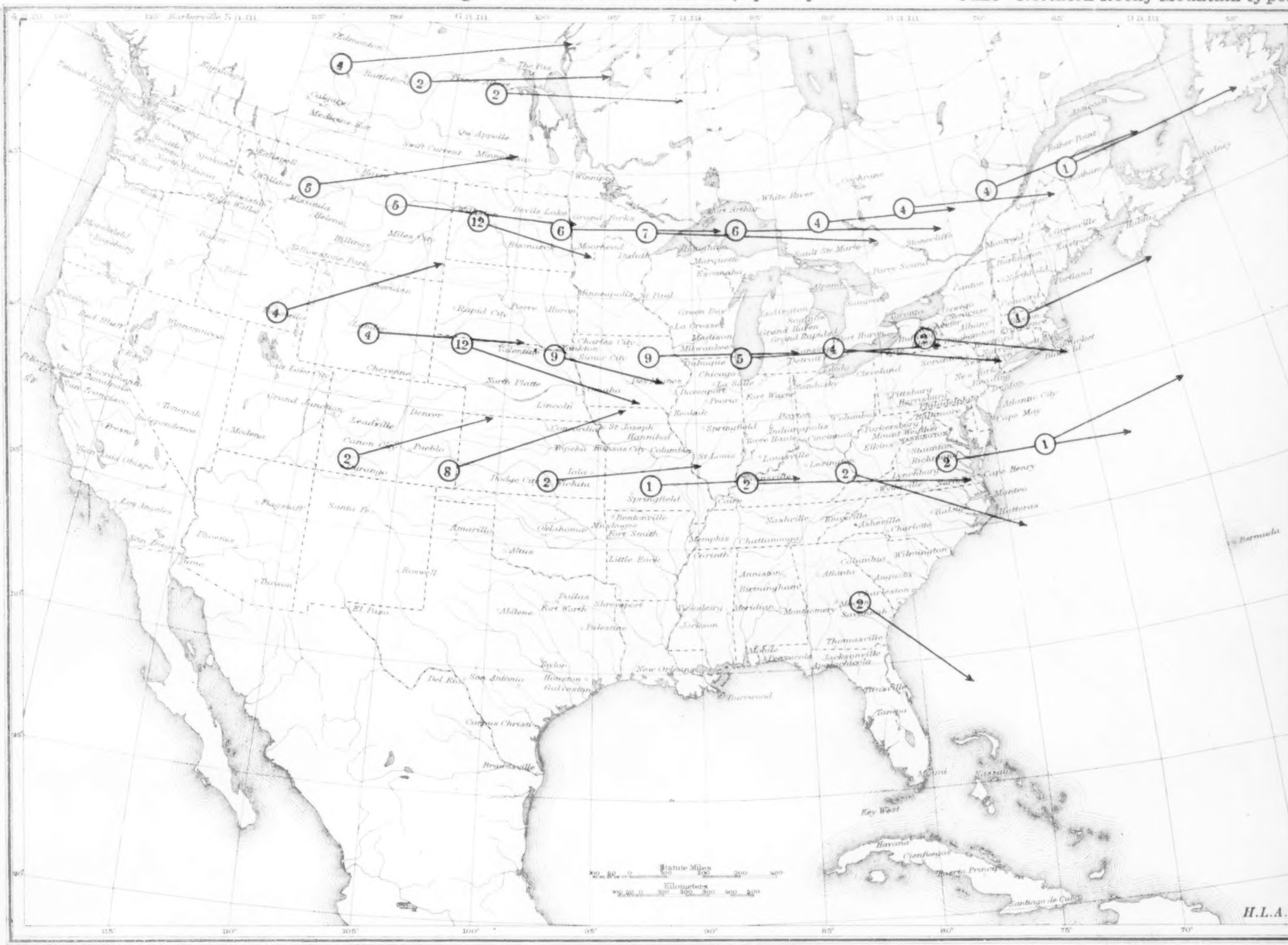


Chart 51.—Average 24-hour movement of storms, by 5°-squares. June—Colorado type.

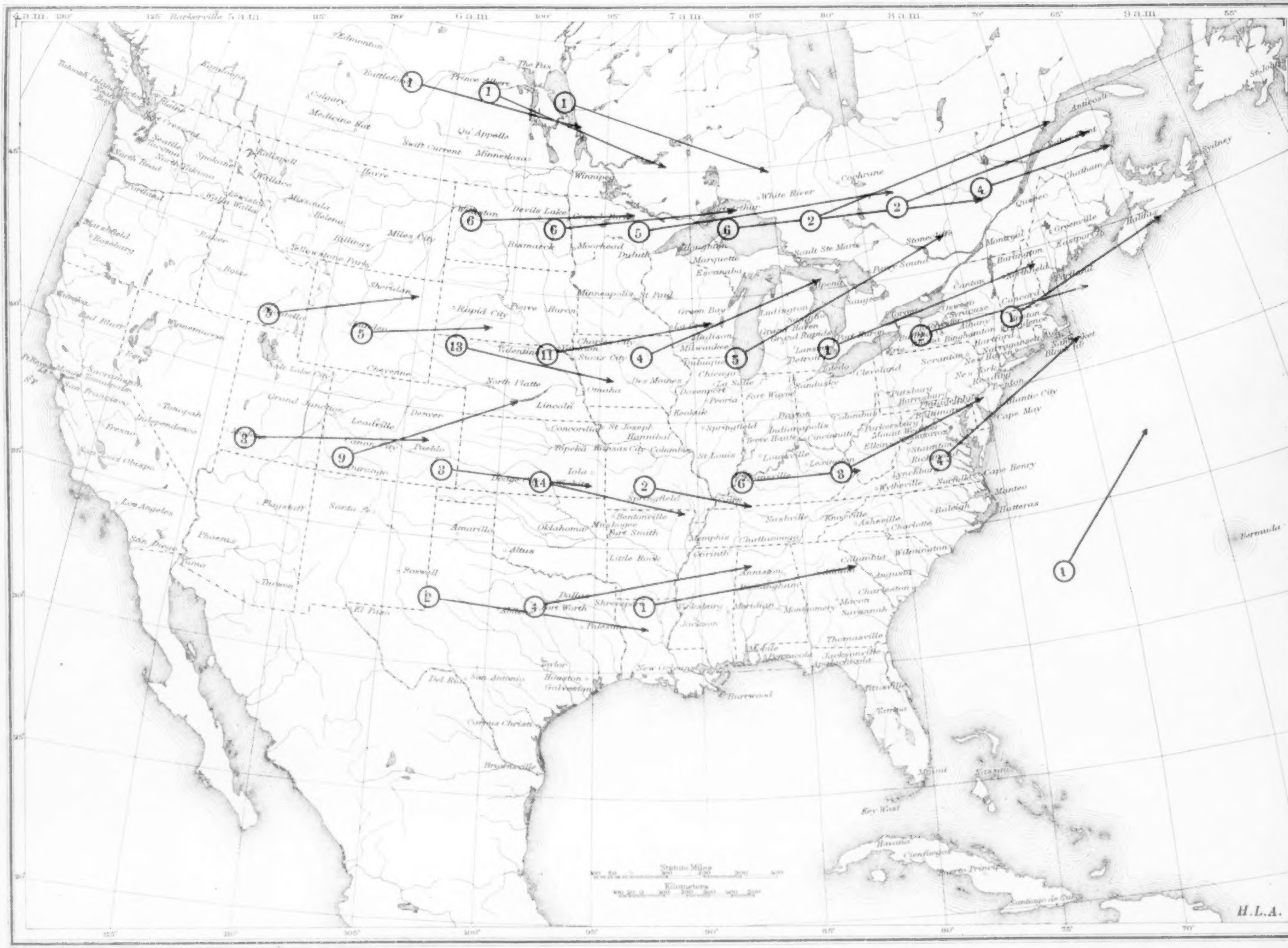
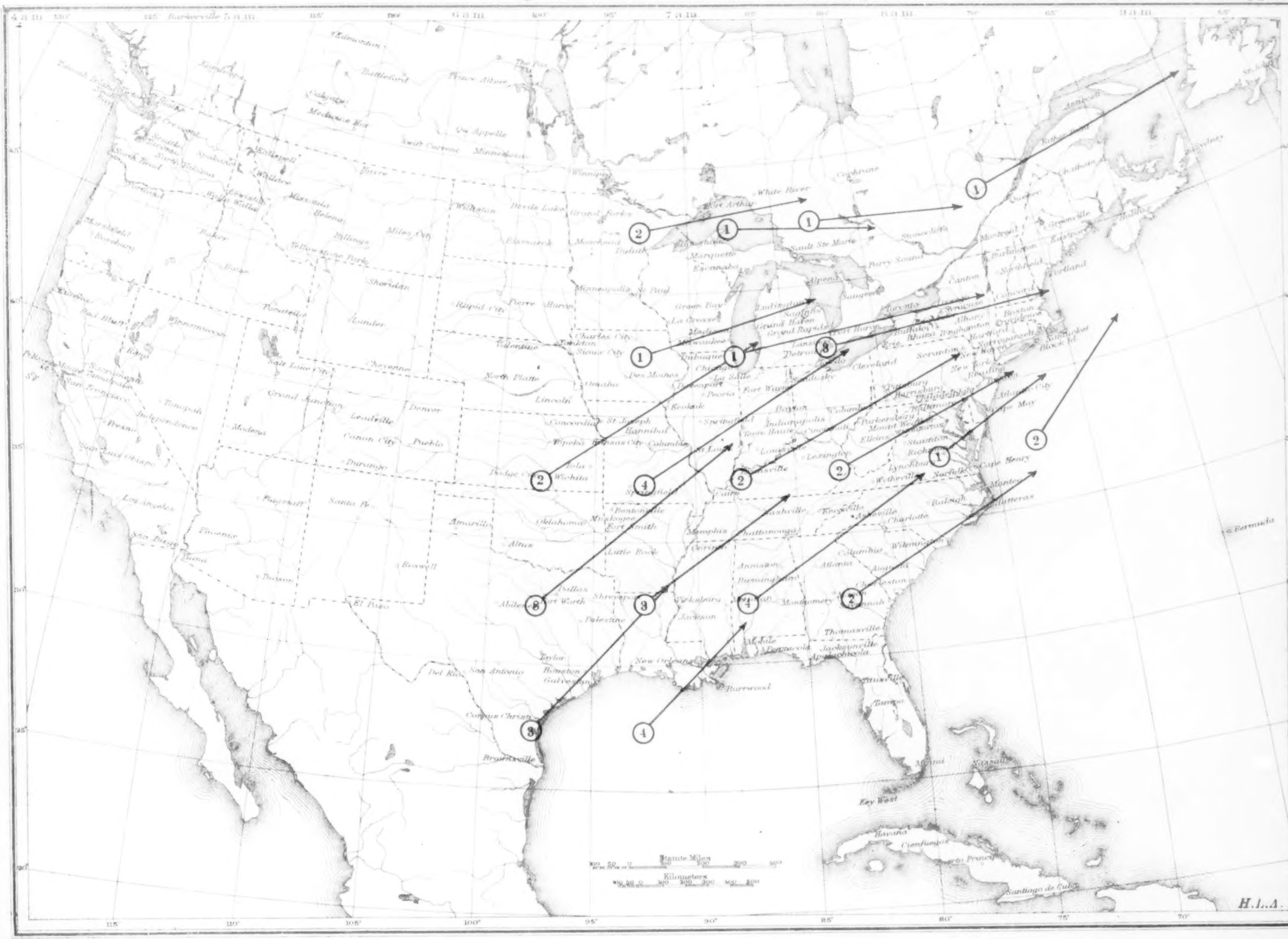


Chart 52.—Average 24-hour movement of storms, by 5° squares.

June—Texas type.



June—East Gulf type.

Chart 53.—Average 24-hour movement of storms, by 5°-squares.

Chart 54.—Average 24-hour movement of storms, by 5°-squares. June—South Atlantic type.

Chart 55.—Average 24-hour movement of storms, by 5°-squares. June—Central type.

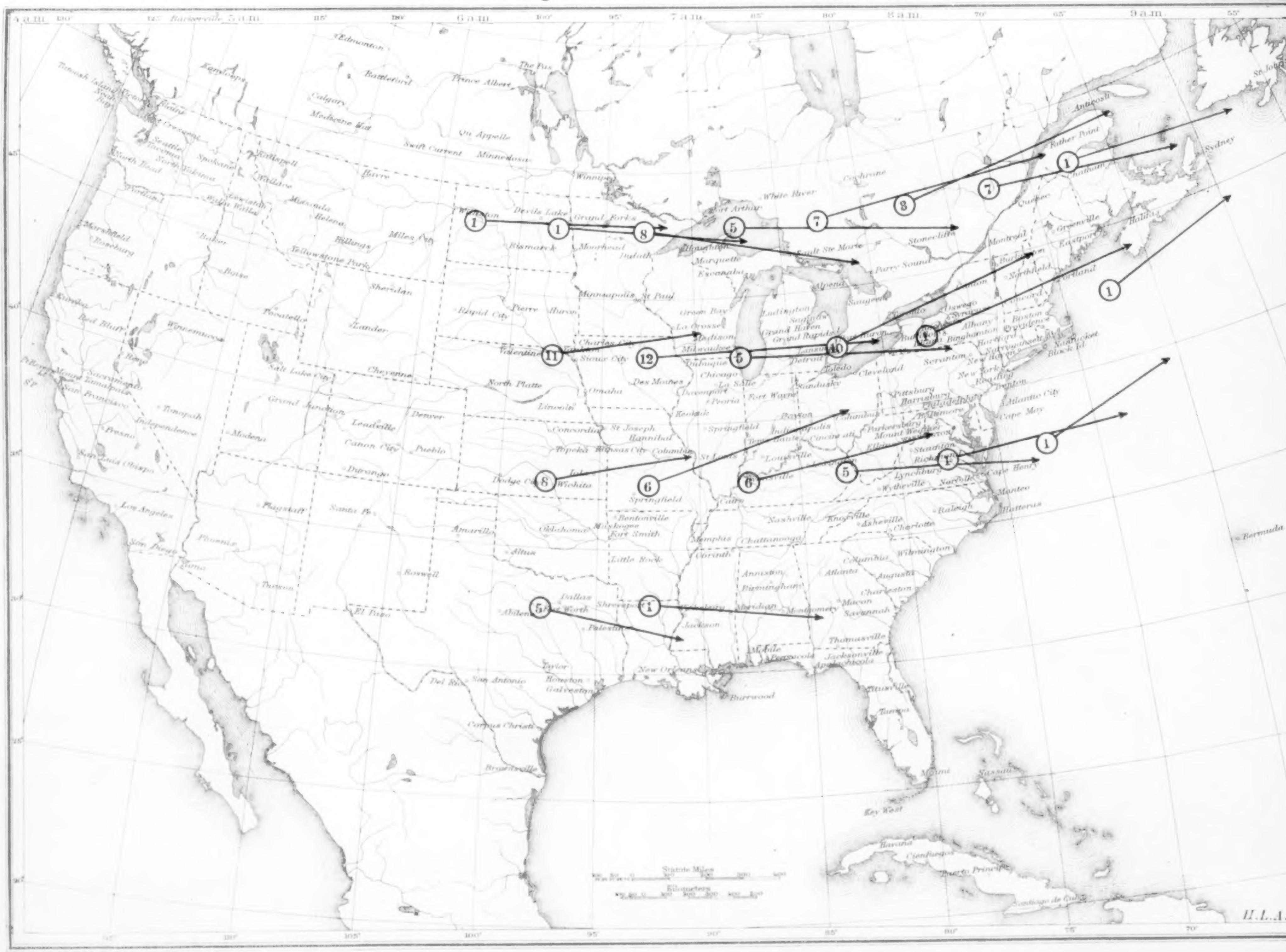


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Chart 56.—Average 24-hour movement of storms, by 5°-squares.

July—Alberta type.

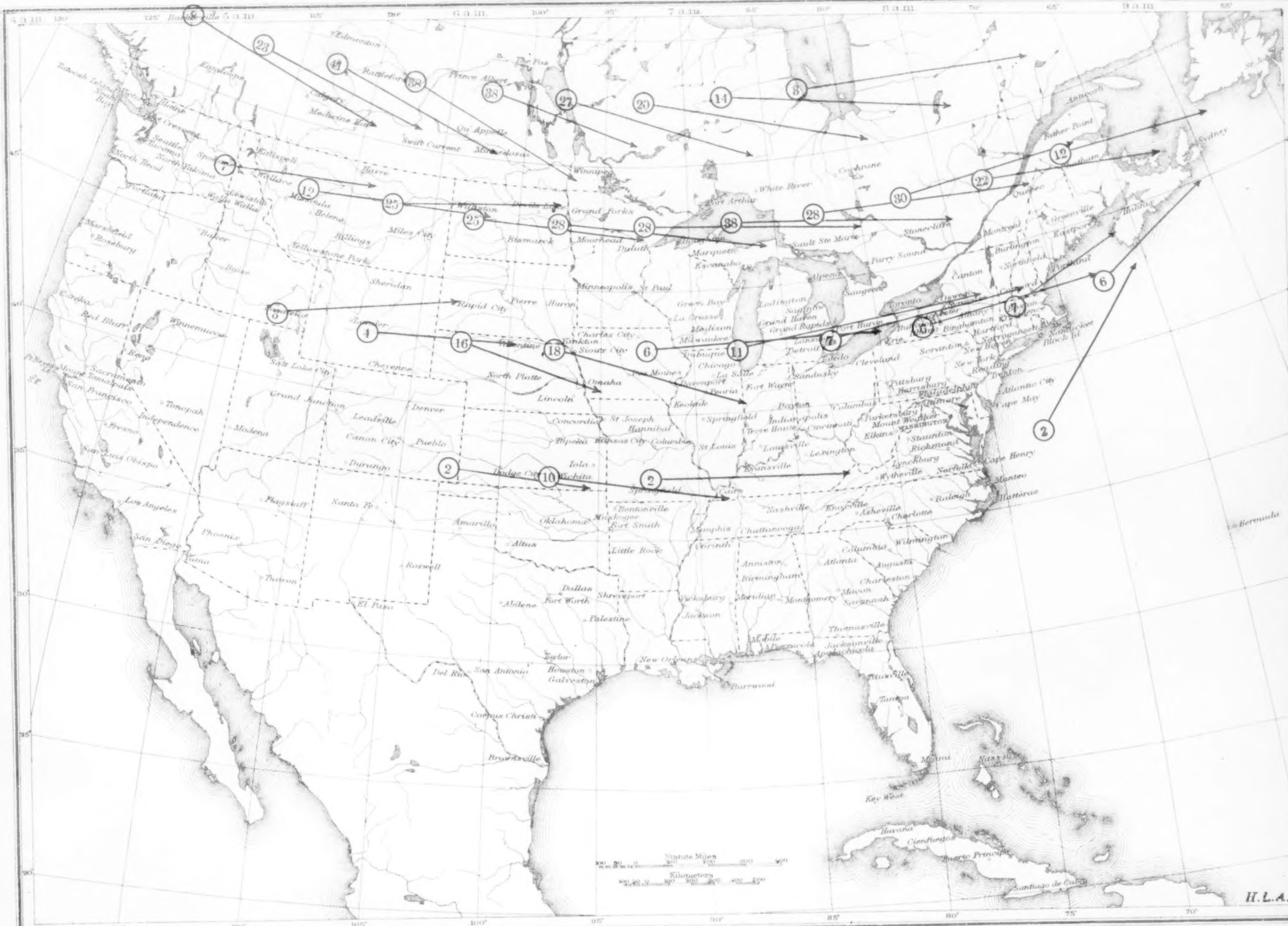


Chart 57.—Average 24-hour movement of storms, by 5°-squares. July—North Pacific type.

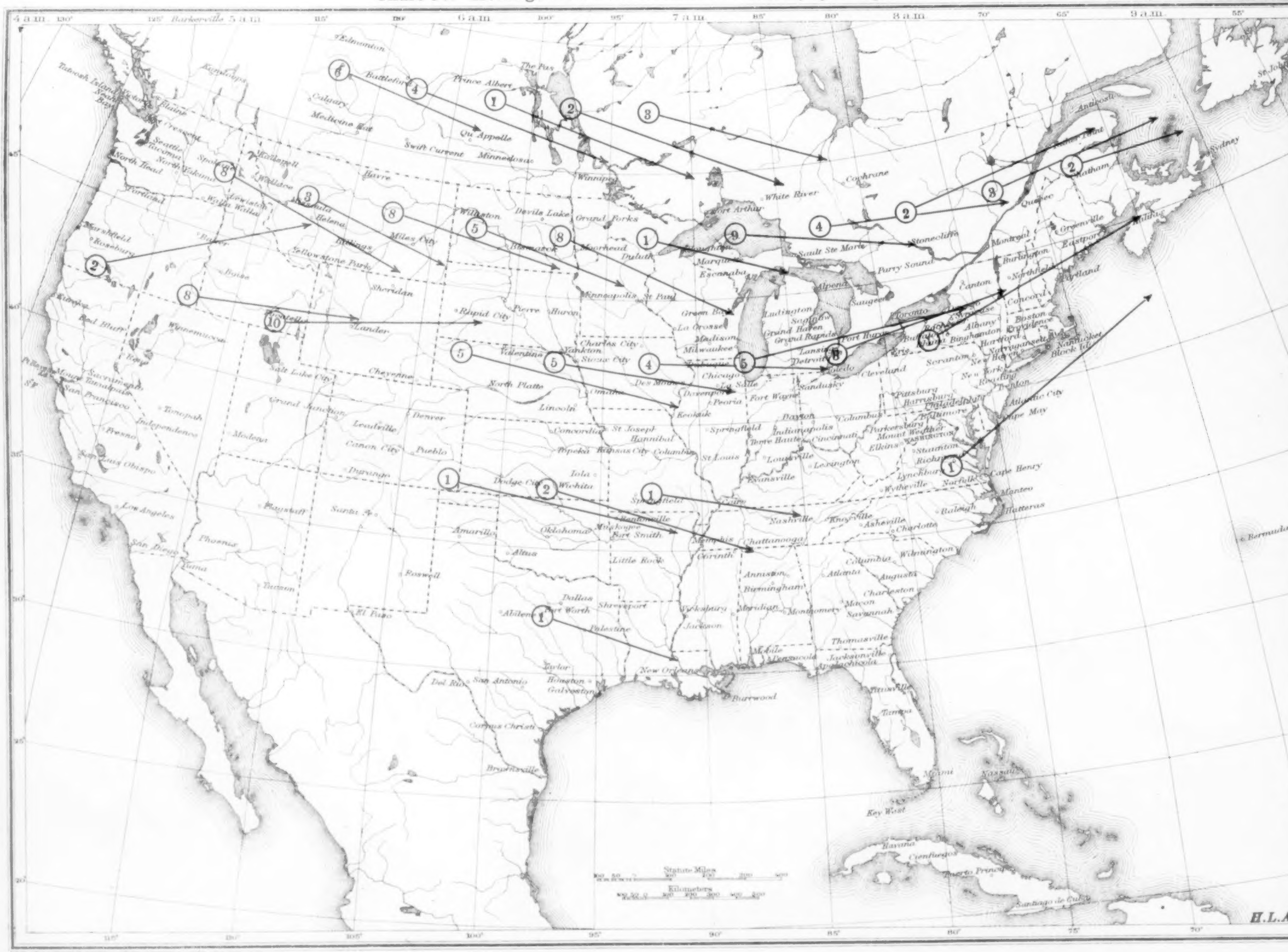


Chart 58.—Average 24-hour movement of storms, by 5°-squares. July—South Pacific type.

Chart 59.—Average 24-hour movement of storms, by 5°-squares. July—Northern Rocky Mountain type.

Chart 60.—Average 24-hour movement of storms, by 5°-squares. July—Colorado type.

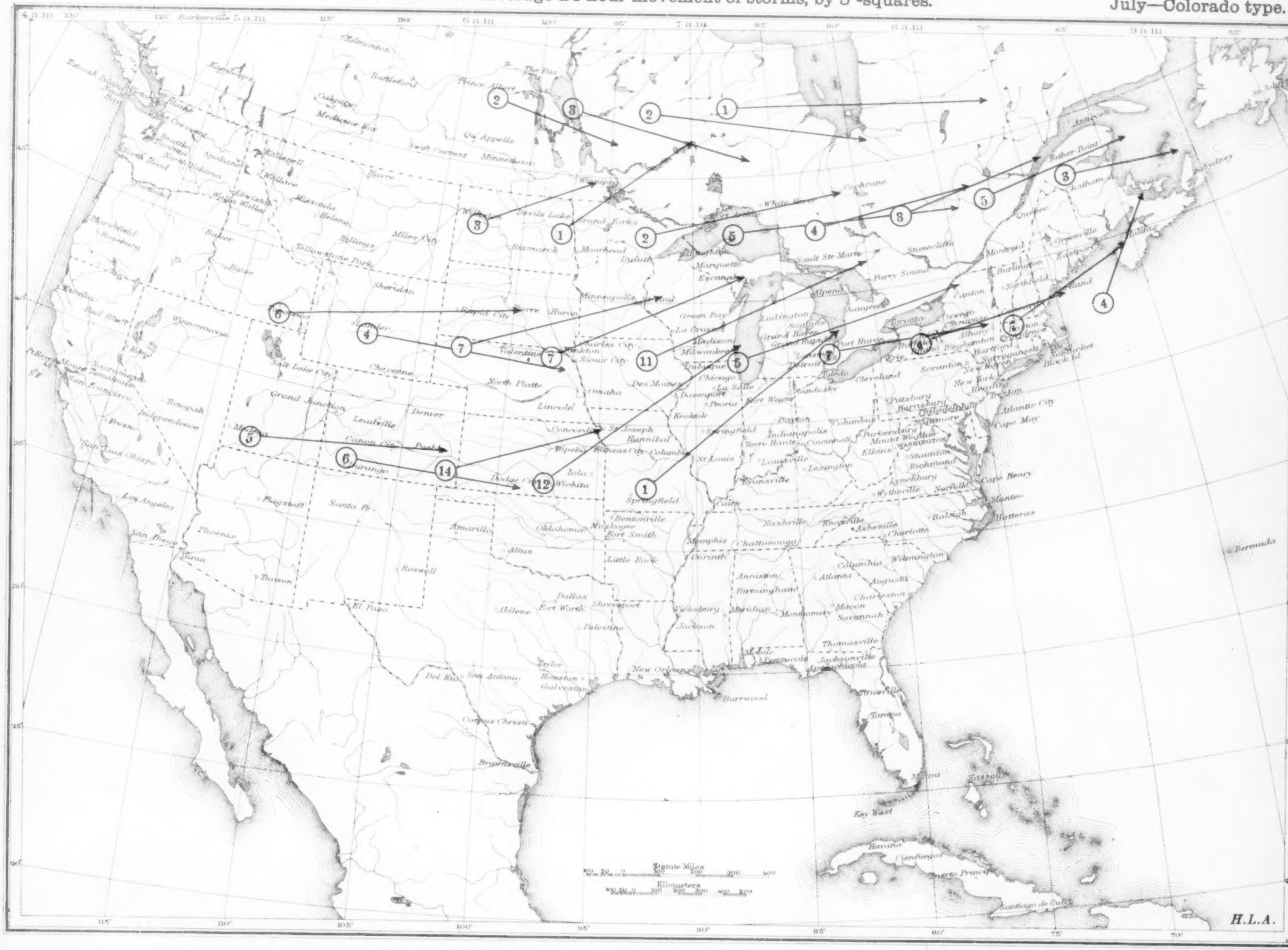


Chart 61.—Average 24-hour movement of storms, by 5° squares.

July—Texas type.

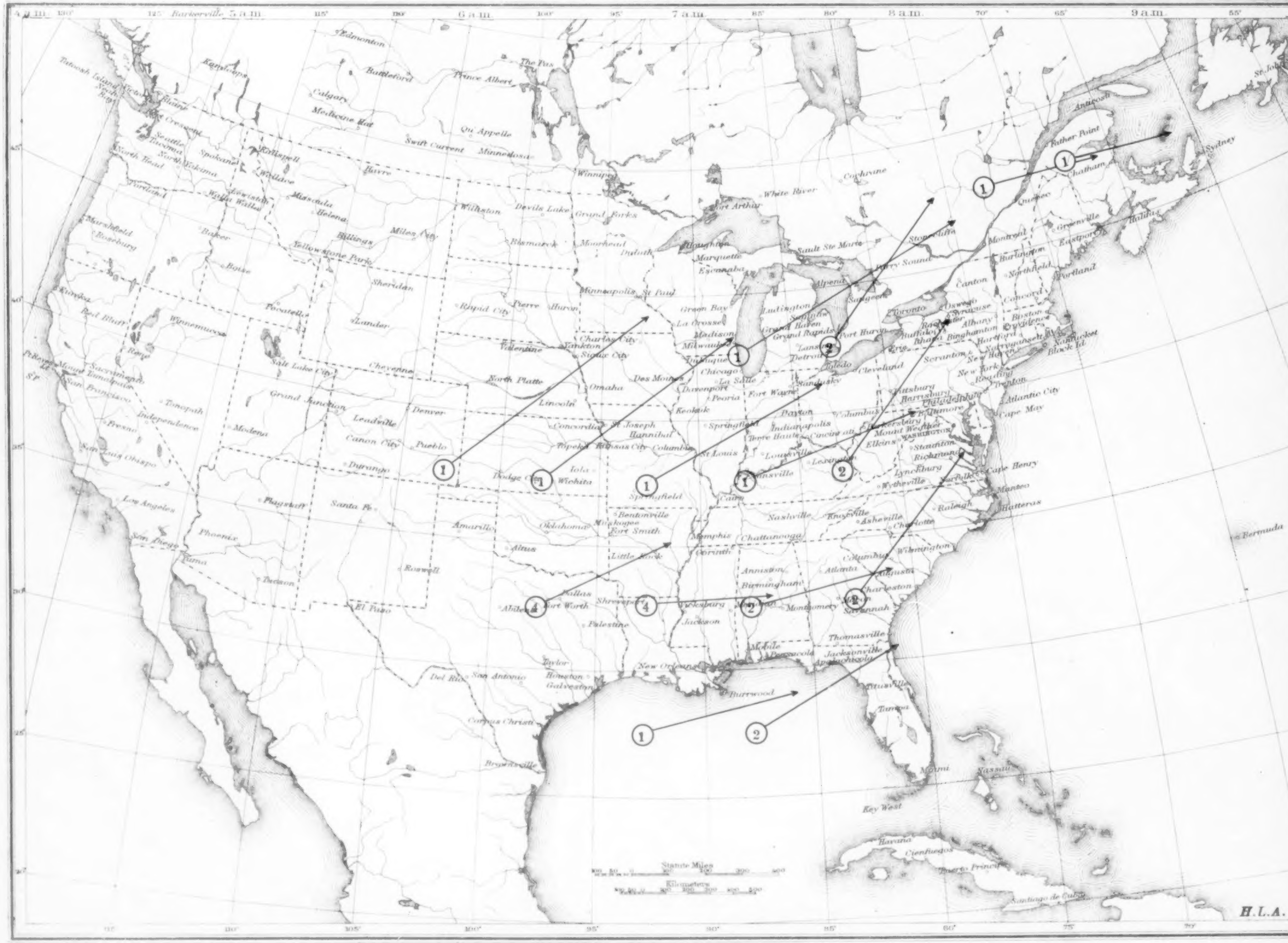


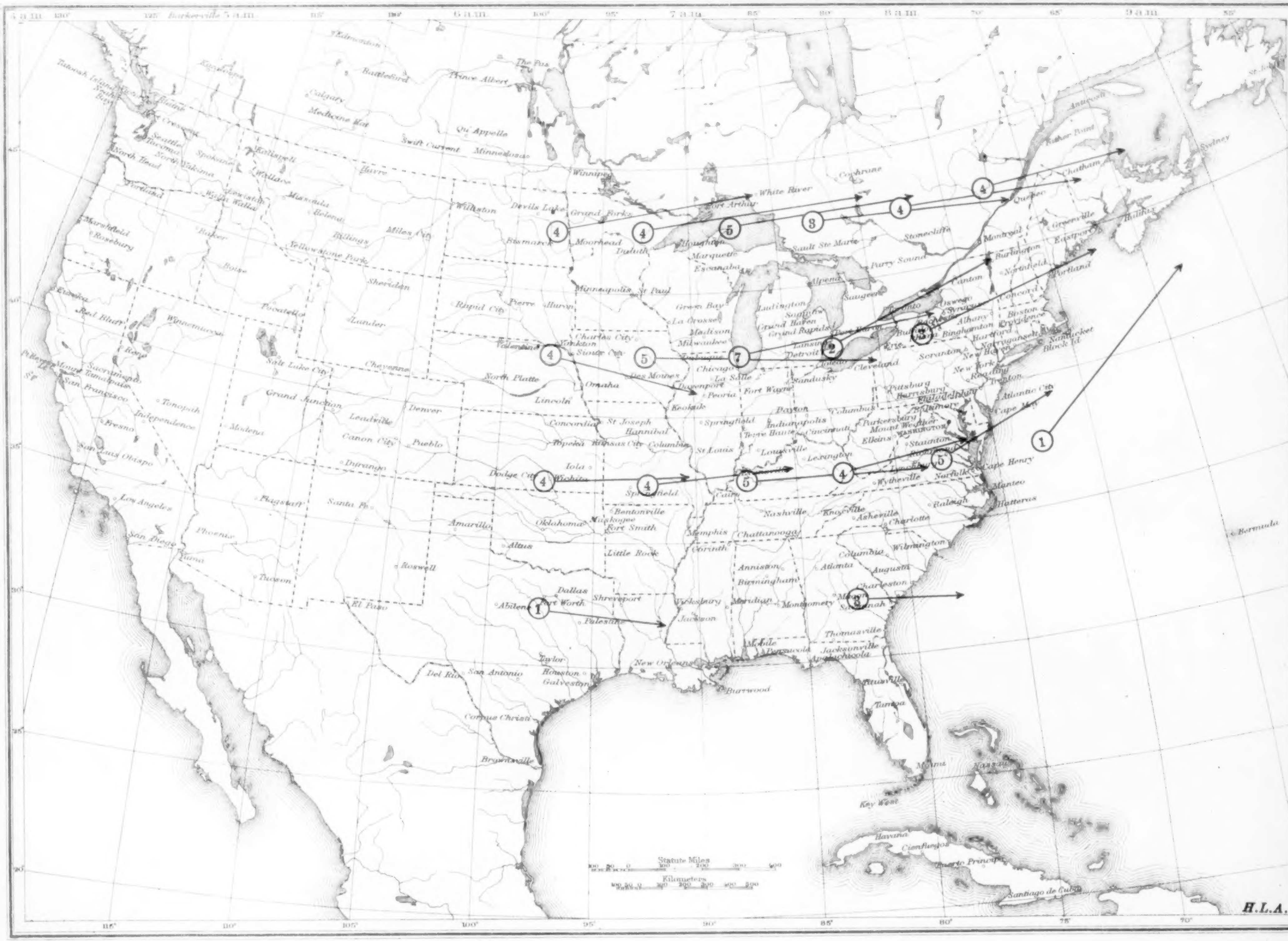
Chart 62.—Average 24-hour movement of storms, by 5°-squares.

July—East Gulf type.

Chart 63.—Average 24-hour movement of storms, by 5°-squares. **July—South Atlantic type.**

Chart 64.—Average 24-hour movement of storms, by 5°-squares.

July—Central type.



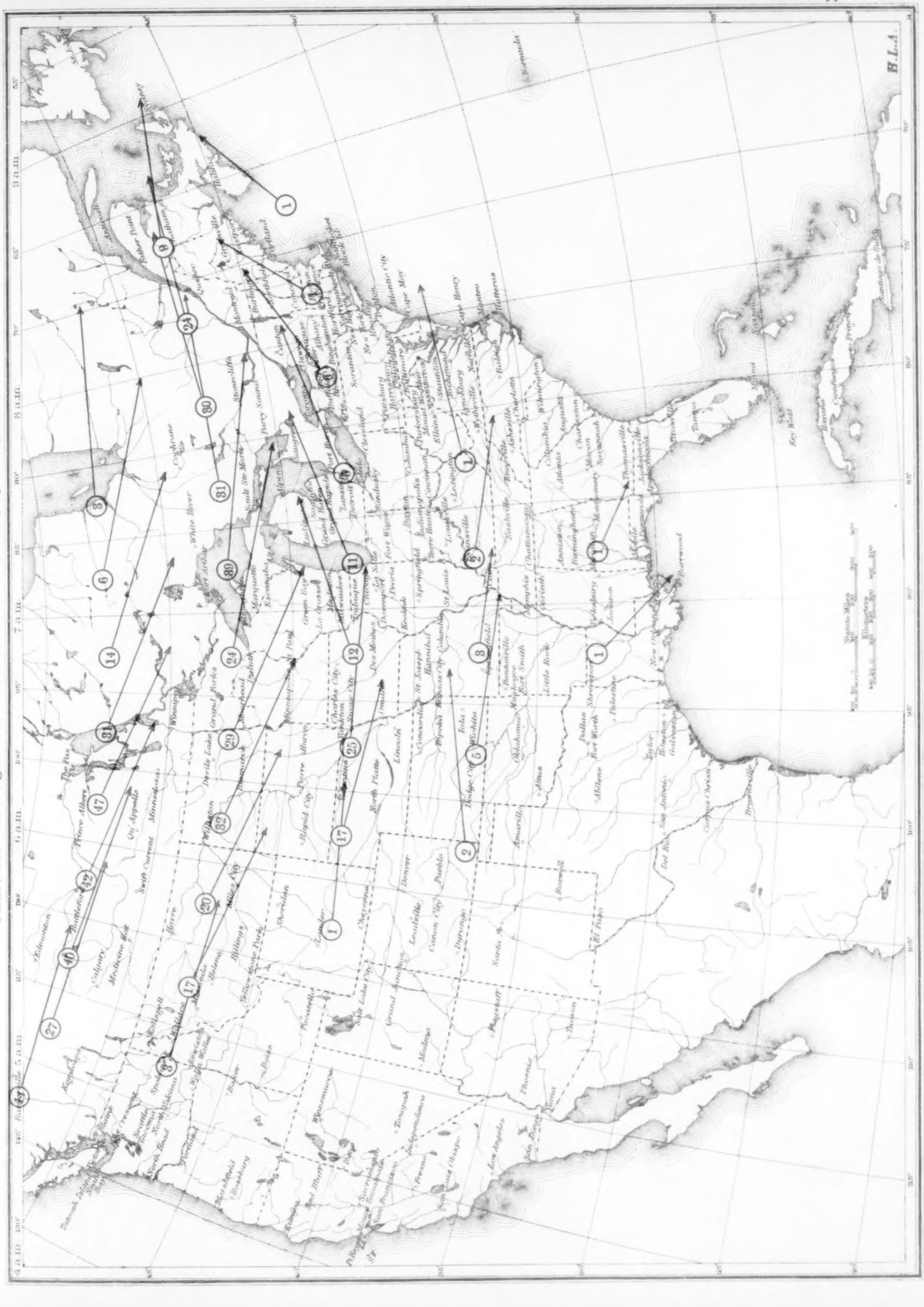


Chart 65.—Average 24-hour movement of storms, by 5°-squares.

August—Alberta type.

Chart 66.—Average 24-hour movement of storms, by 5°-squares.

August.—North Pacific type.

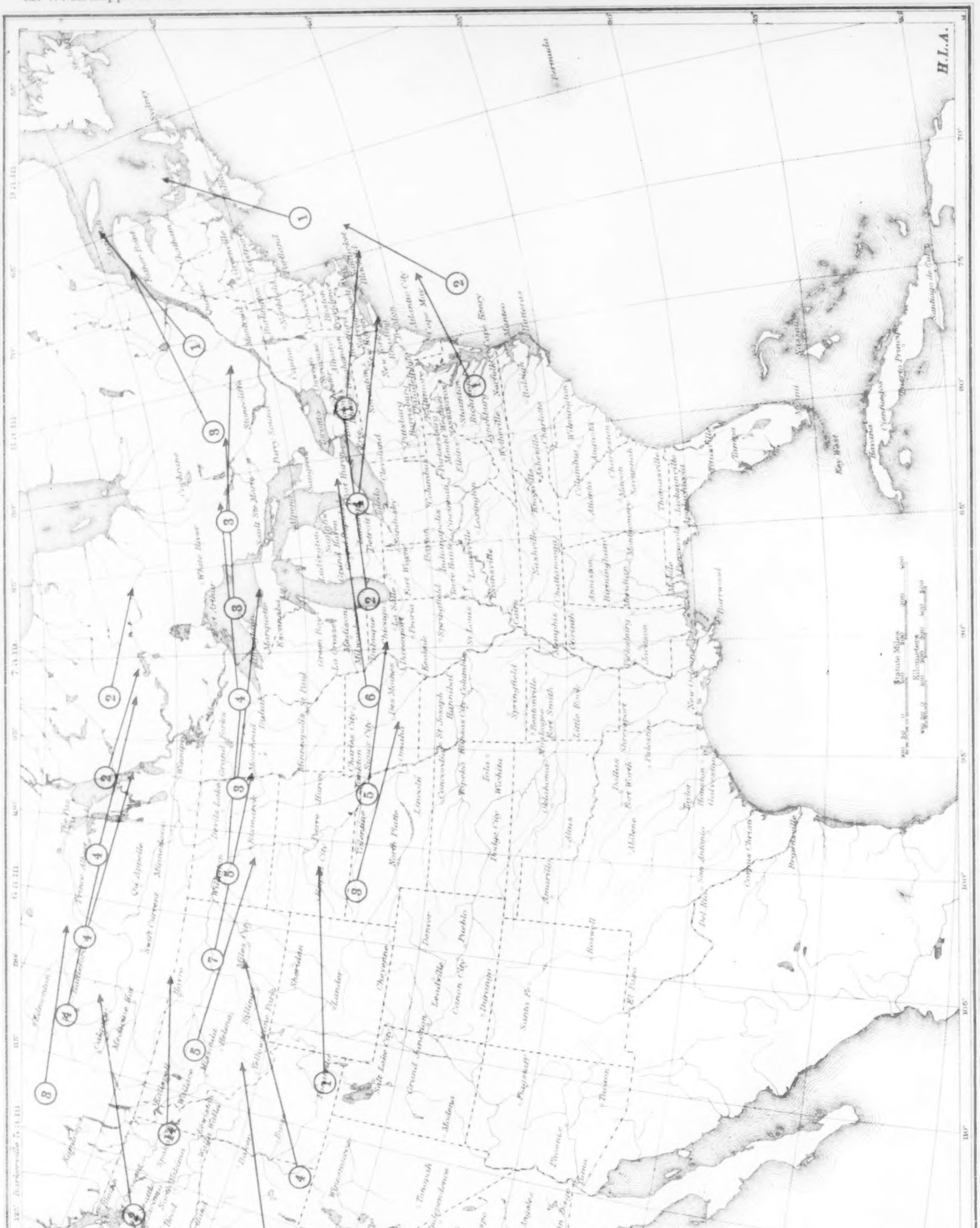


Chart 67.—Average 24-hour movement of storms, by 5°-squares. August—South Pacific type.

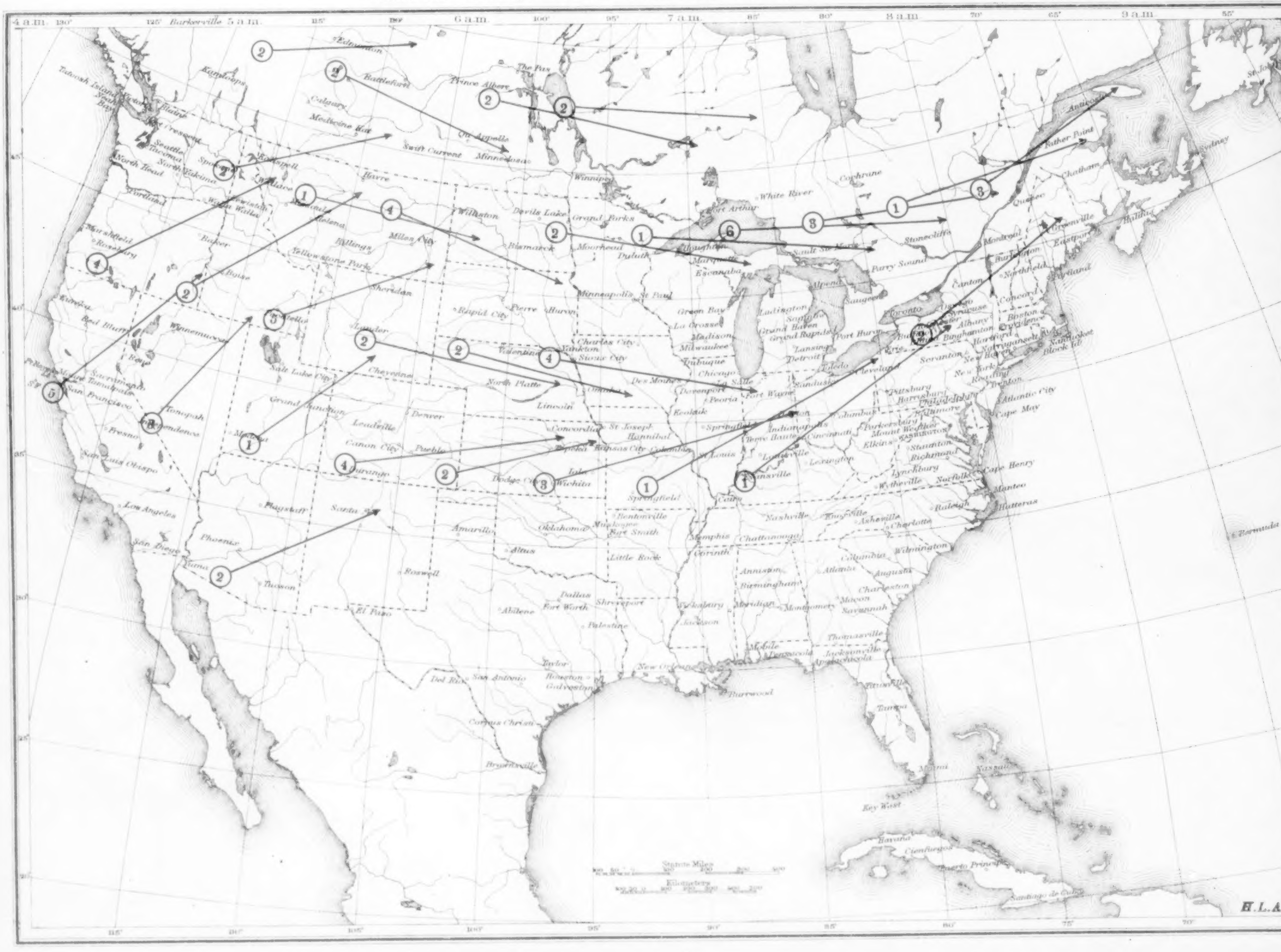


Chart 68.—Average 24-hour movement of storms, by 5°-squares. August—Northern Rocky Mountain type.

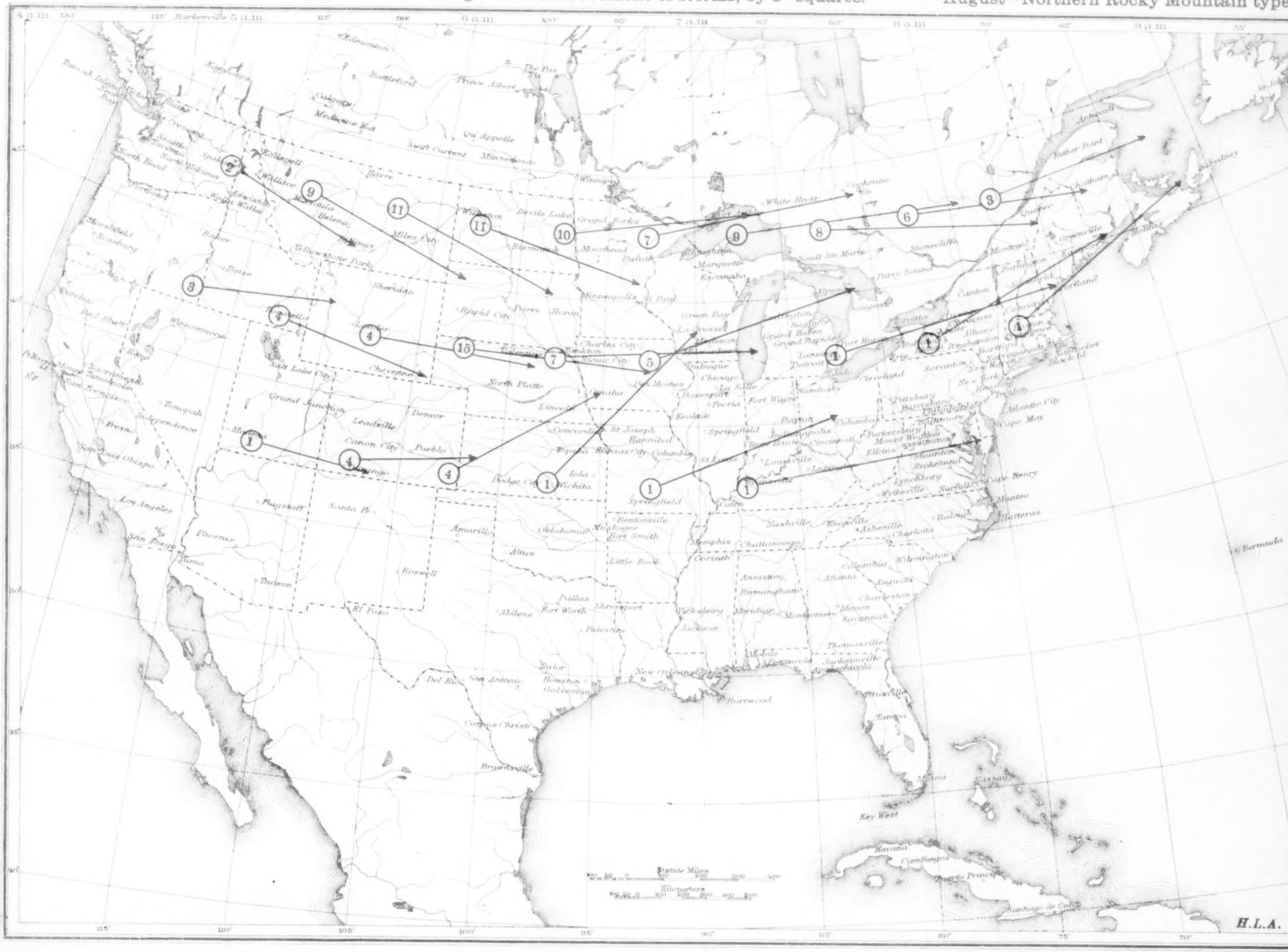


Chart 69.—Average 24-hour movement of storms, by 5°-squares. August—Colorado type.

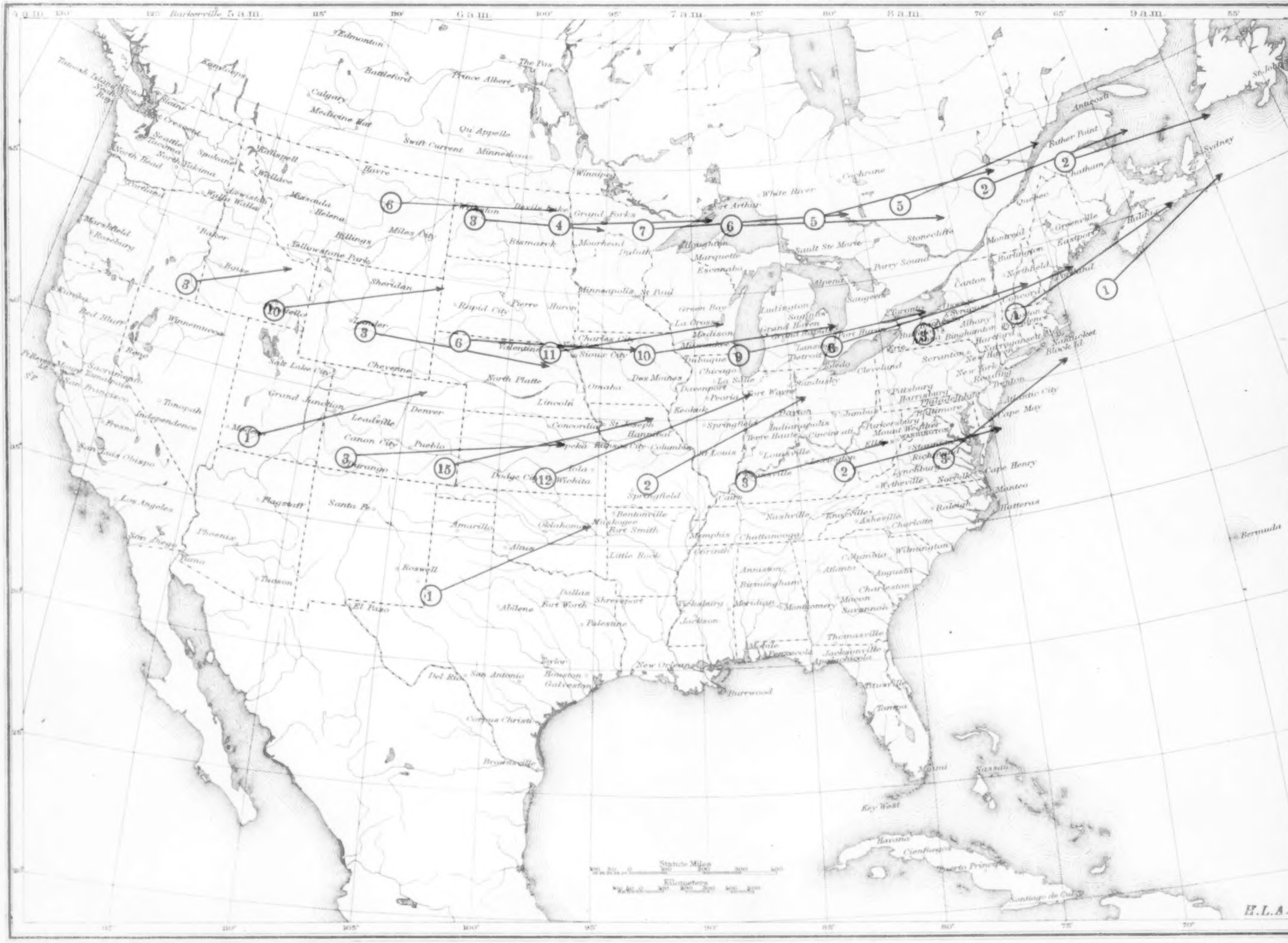


Chart 70.—Average 24-hour movement of storms, by 5° squares.

August—Texas type.

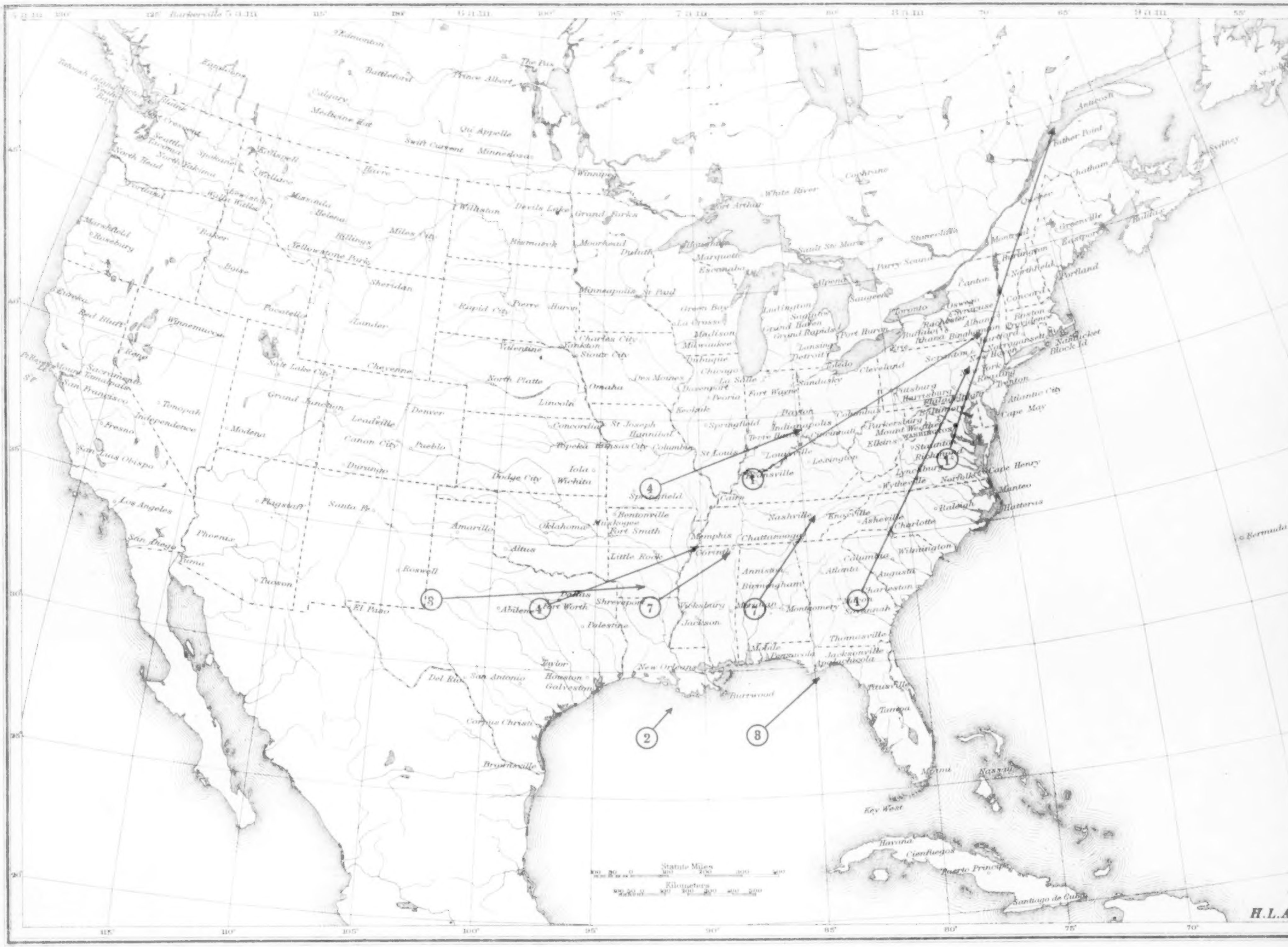


Chart 71.—Average 24-hour movement of storms, by 5°-squares.

August—East Gulf type.

Chart 72.—Average 24-hour movement of storms, by 5°-squares. August—South Atlantic type.

Chart 73.—Average 24-hour movement of storms, by 5°-squares.

August—Central type.

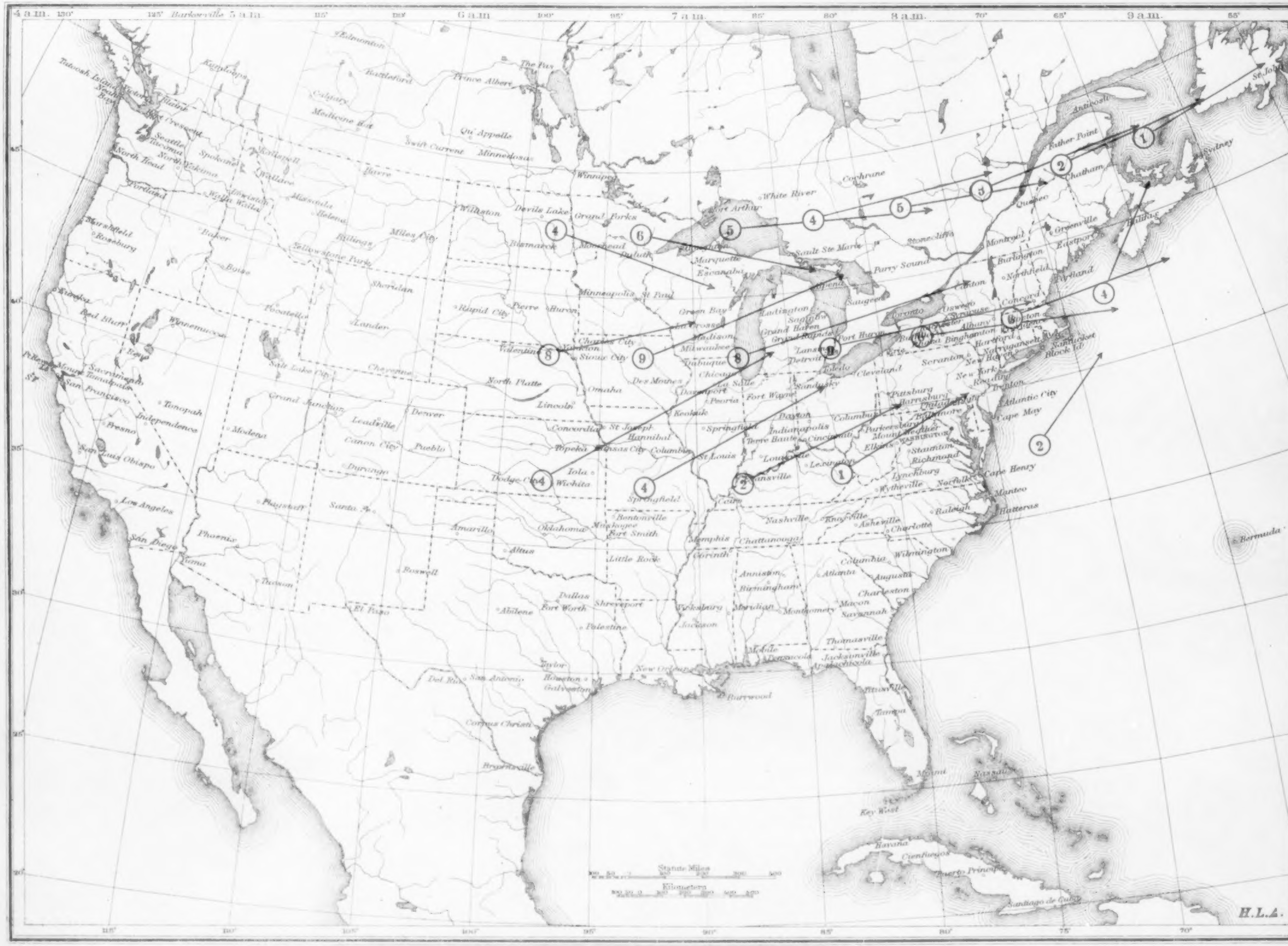


Chart 74.—Average 24-hour movement of storms, by 5°-squares. September—Alberta type.

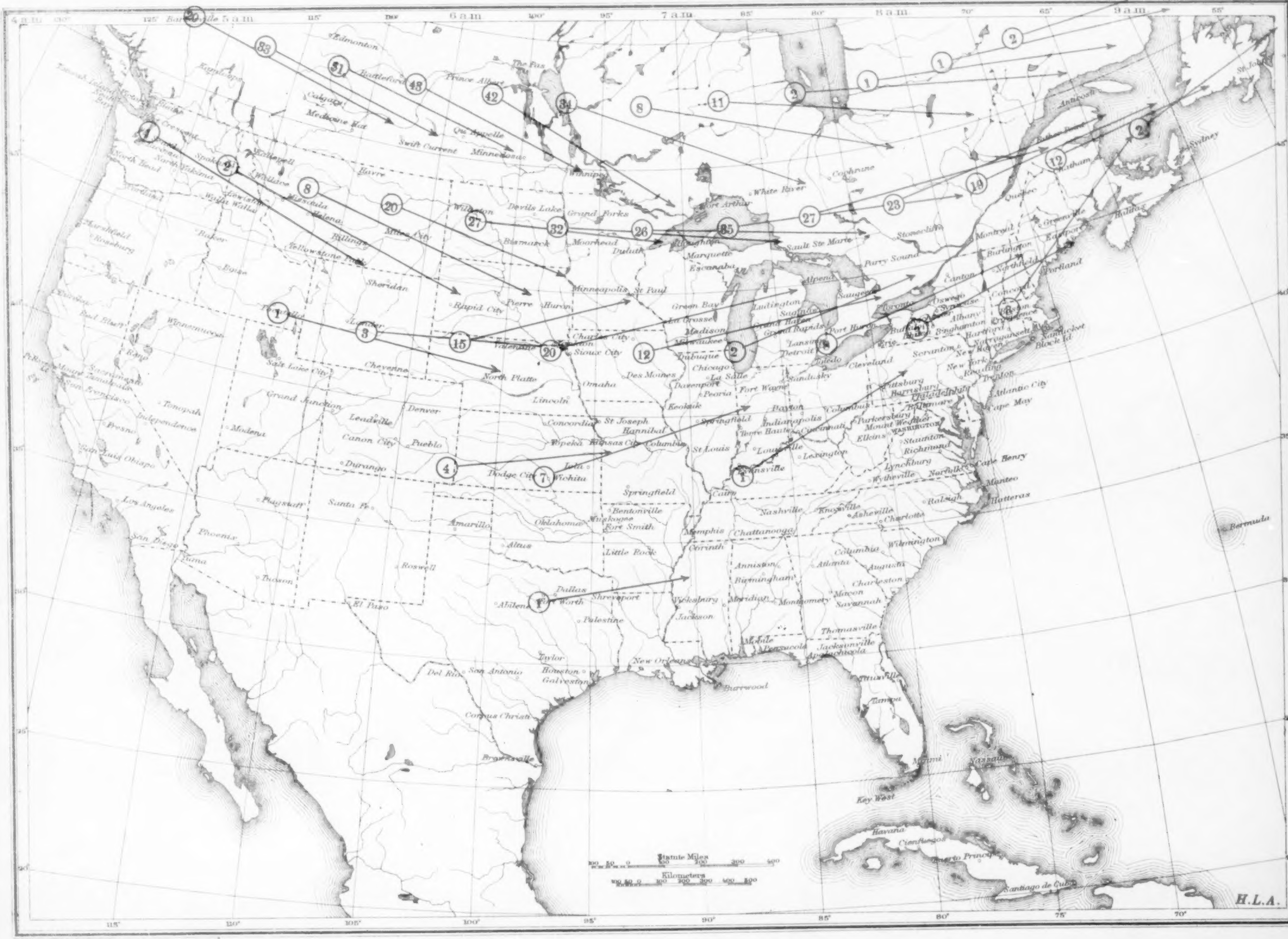


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Chart 75.—Average 24-hour movement of storms, by 5°-squares. September—North Pacific type.

Chart 76.—Average 24-hour movement of storms, by 5°-squares. September—South Pacific type.

Chart 77.—Average 24-hour movement of storms, by 5°-squares. September—Northern Rocky Mountain type.

Chart 78.—Average 24-hour movement of storms, by 5°-squares. September—Colorado type.

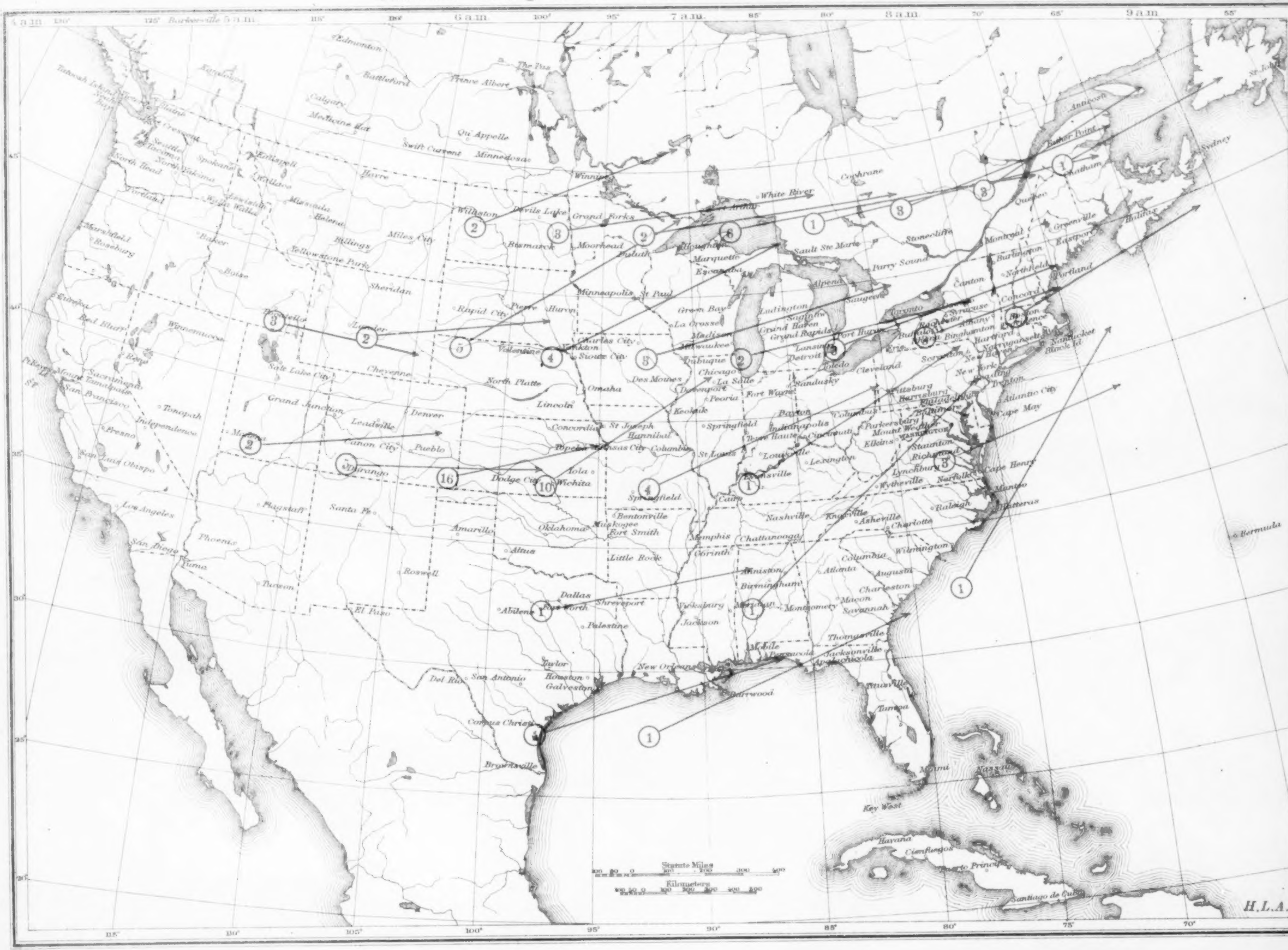


Chart 79.—Average 24-hour movement of storms, by 5° squares.

September—Texas type.

Chart 80.—Average 24-hour movement of storms, by 5°-squares. September—East Gulf type.

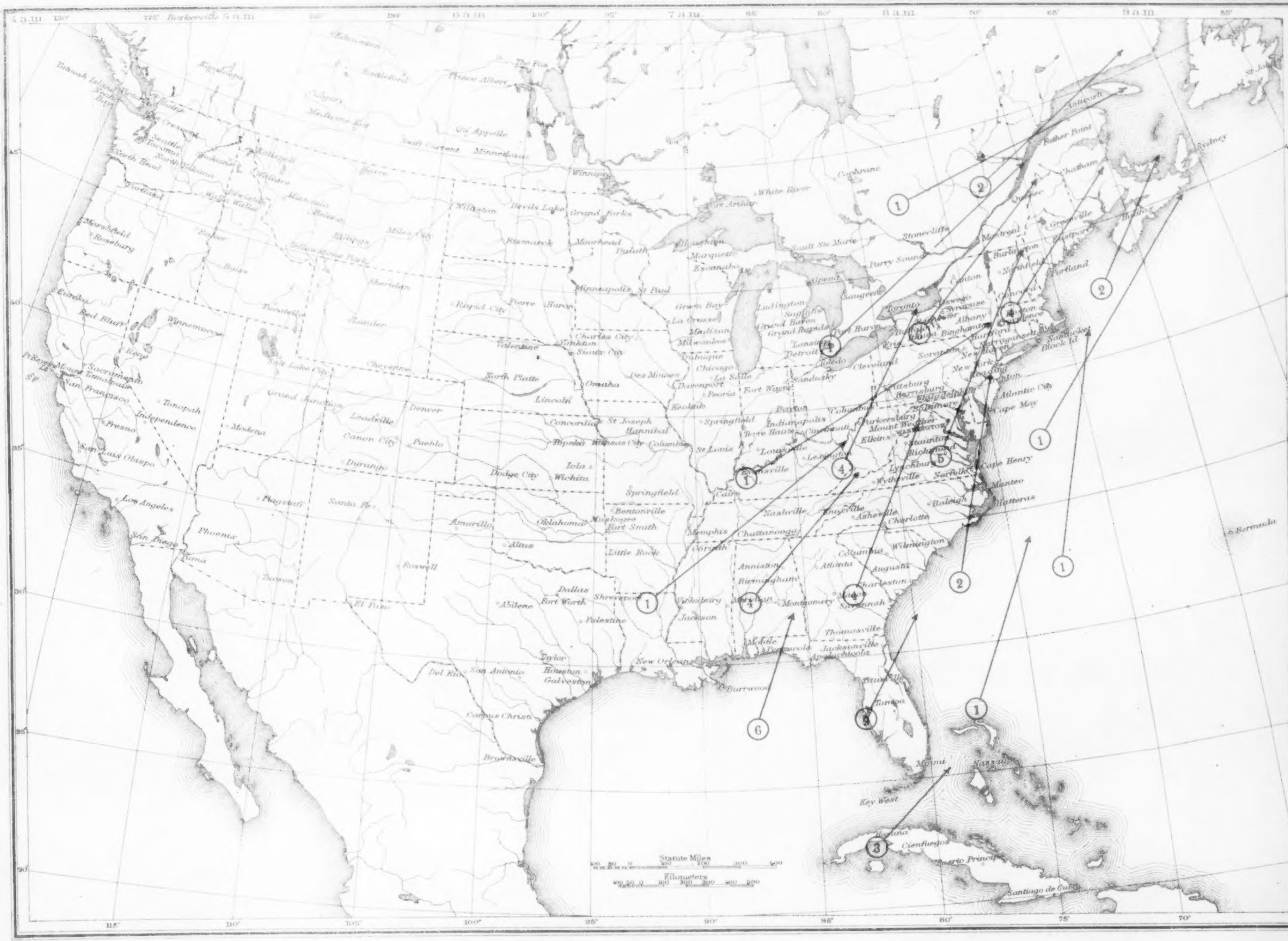


Chart 81.—Average 24-hour movement of storms, by 5°-squares. September—South Atlantic type.

Chart 82.—Average 24-hour movement of storms, by 5°-squares. September—Central type.

Chart 83.—Average 24-hour movement of storms, by 5°-squares. October—Alberta type.

Chart 84.—Average 24 hour movement of storms, by 5°-squares. October—North Pacific type.

Chart 85.—Average 24-hour movement of storms, by 5°-squares. October—South Pacific type.

Chart 86.– Average 24-hour movement of storms, by 5°-squares. October—Northern Rocky Mountain type.

Chart 87.—Average 24-hour movement of storms, by 5°-squares.

October—Colorado type.

Chart 88.—Average 24-hour movement of storms, by 5° squares.

October—Texas type.

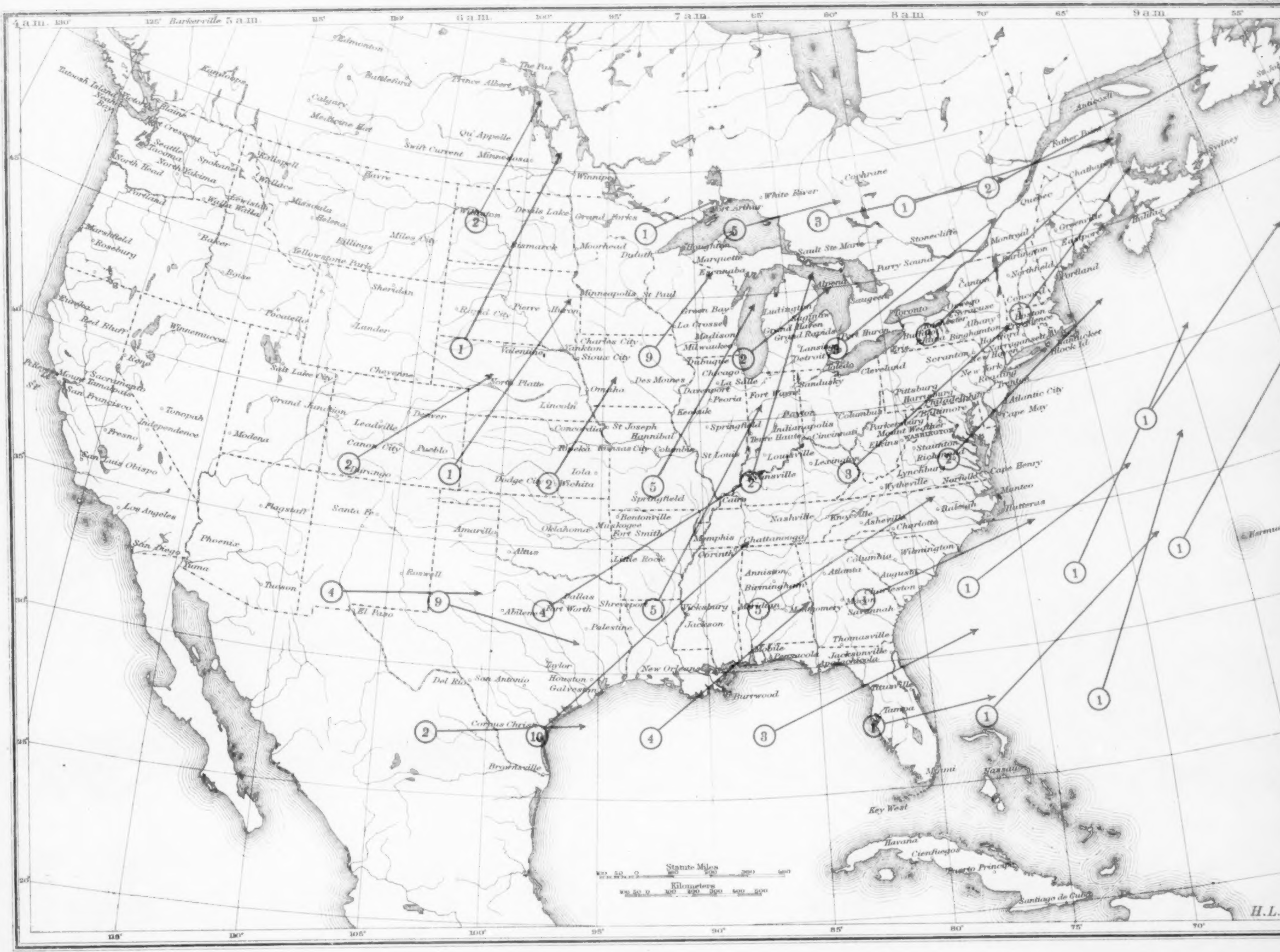


Chart 89.—Average 24-hour movement of storms, by 5°-squares.

October—East Gulf type.

Chart 90.—Average 24-hour movement of storms, by 5°-squares.

October—South Atlantic type.

Chart 91.—Average 24-hour movement of storms, by 5°-squares. October—Central type.

Chart 90.—Average 24-hour movement of storms, by 5°-squares. October—South Atlantic type.

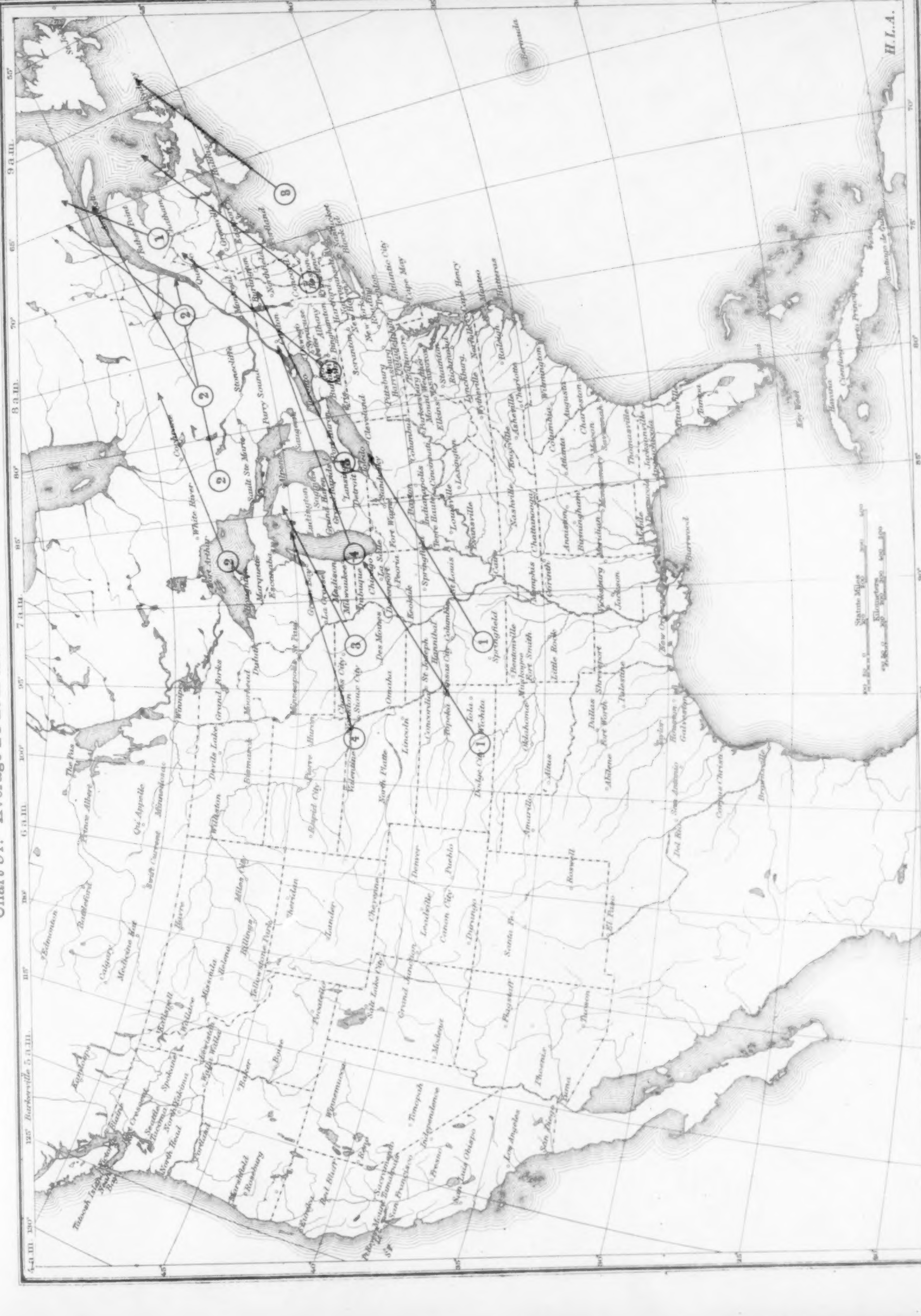


Chart 91.—Average 24-hour movement of storms, by 5°-squares.

October—Central type.

Chart 92.—Average 24-hour movement of storms, by 5°-squares. November—Alberta type.

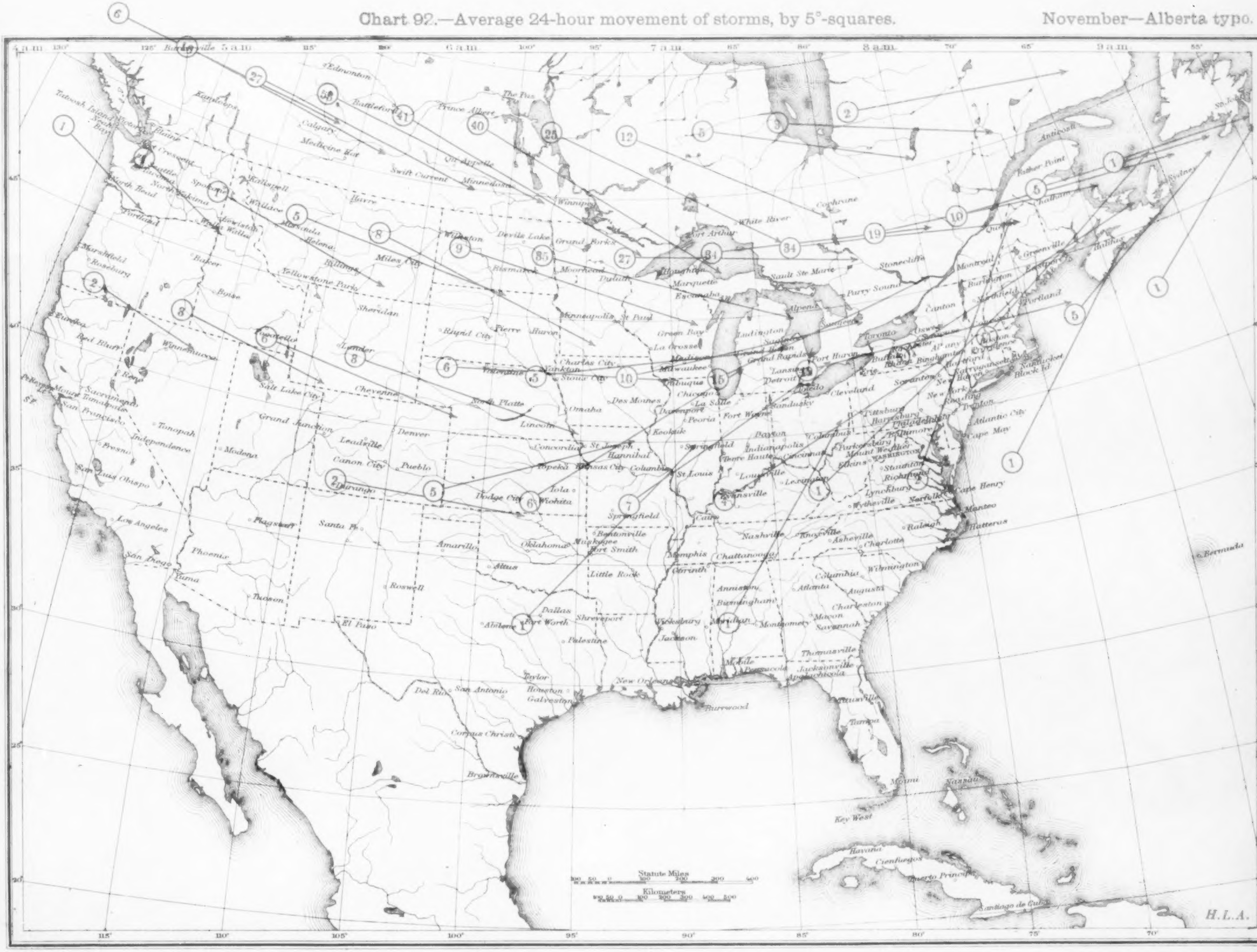


Chart 93.—Average 24-hour movement of storms, by 5°-squares. November—North Pacific type.

Chart 94.—Average 24-hour movement of storms, by 5°-squares. November—South Pacific type.

Chart 95.—Average 24-hour movement of storms, by 5°-squares. November—Northern Rocky Mountain type.

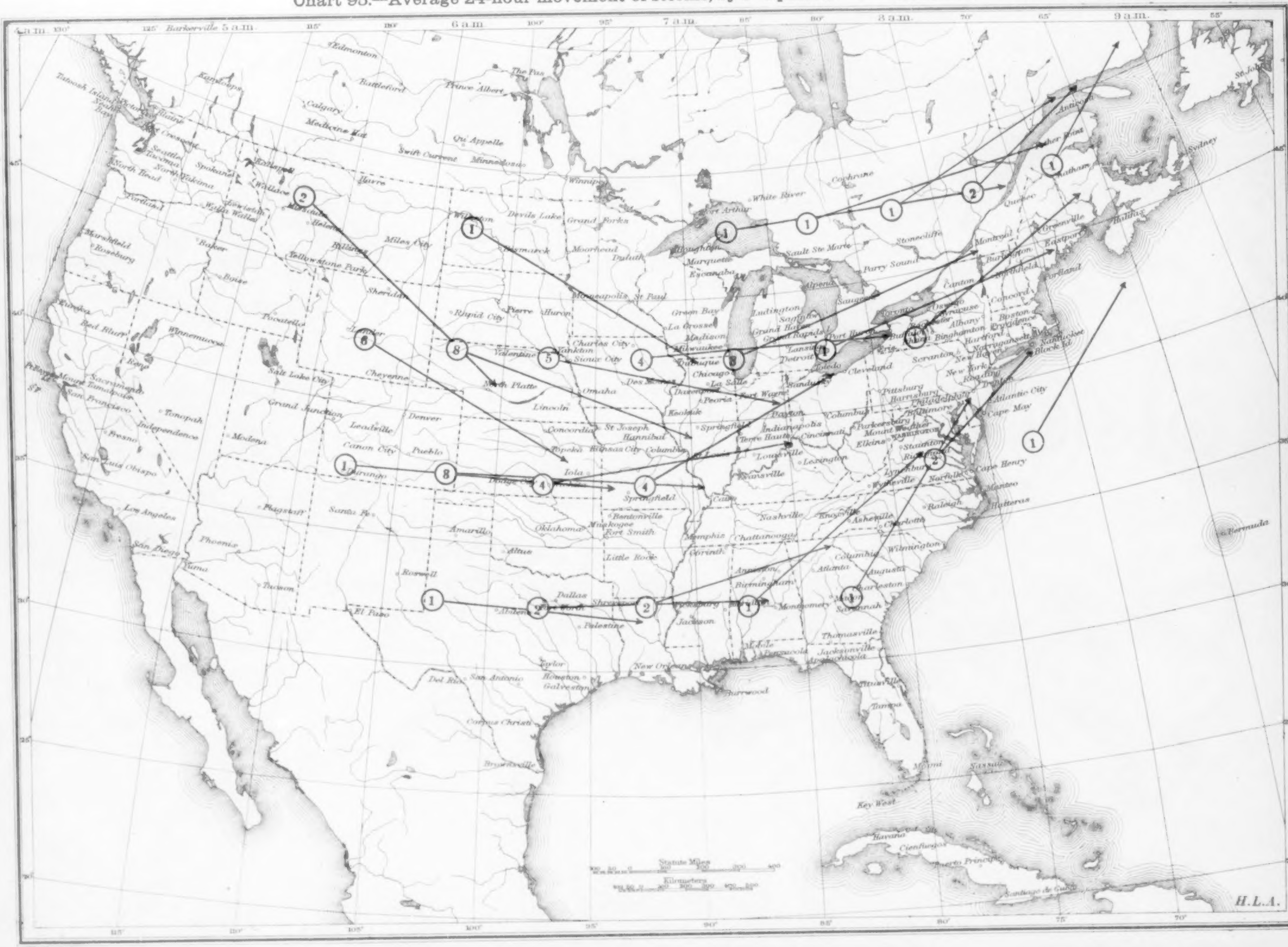


Chart 96.—Average 24-hour movement of storms, by 5°-squares.

November—Colorado type.

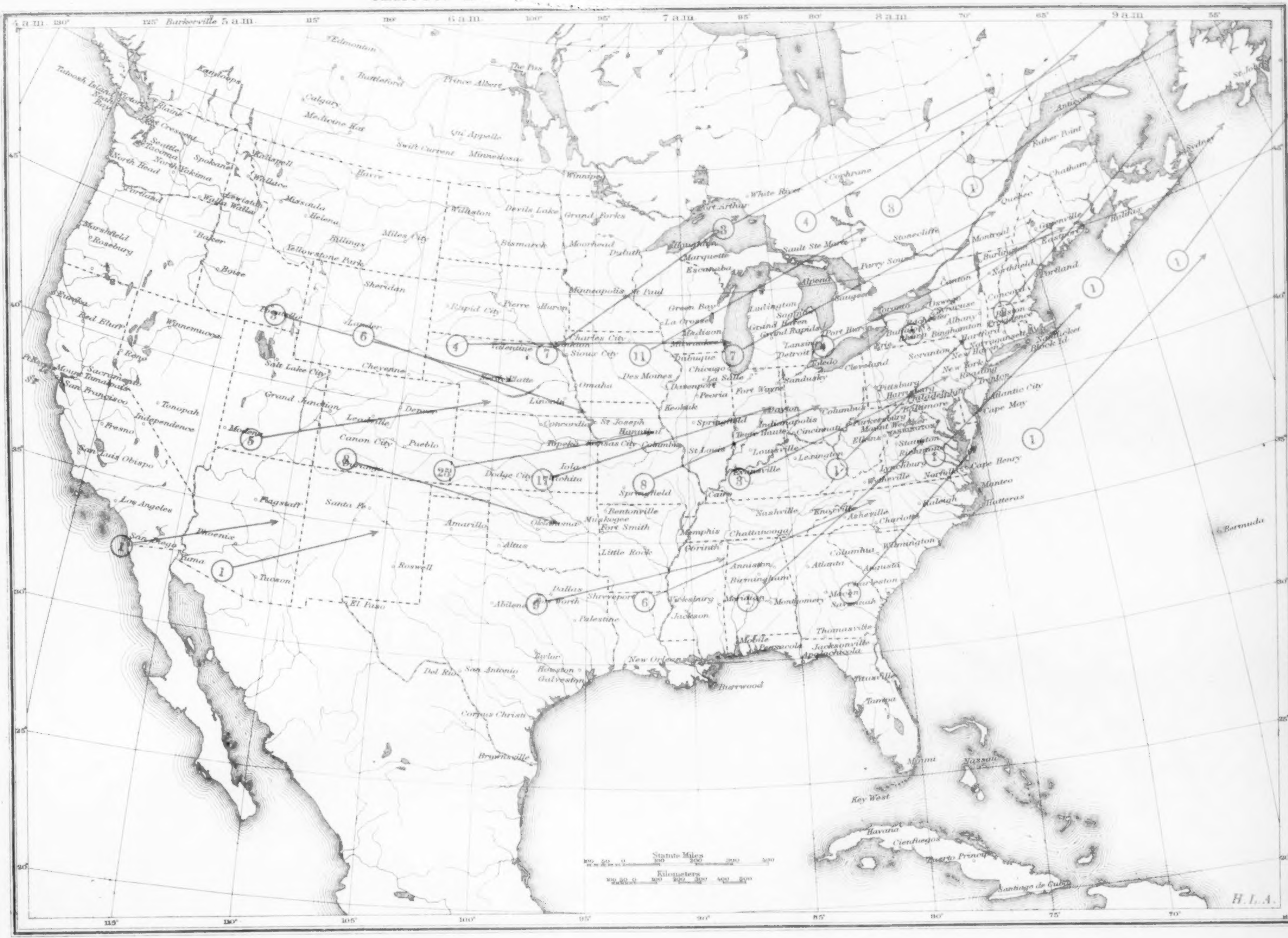
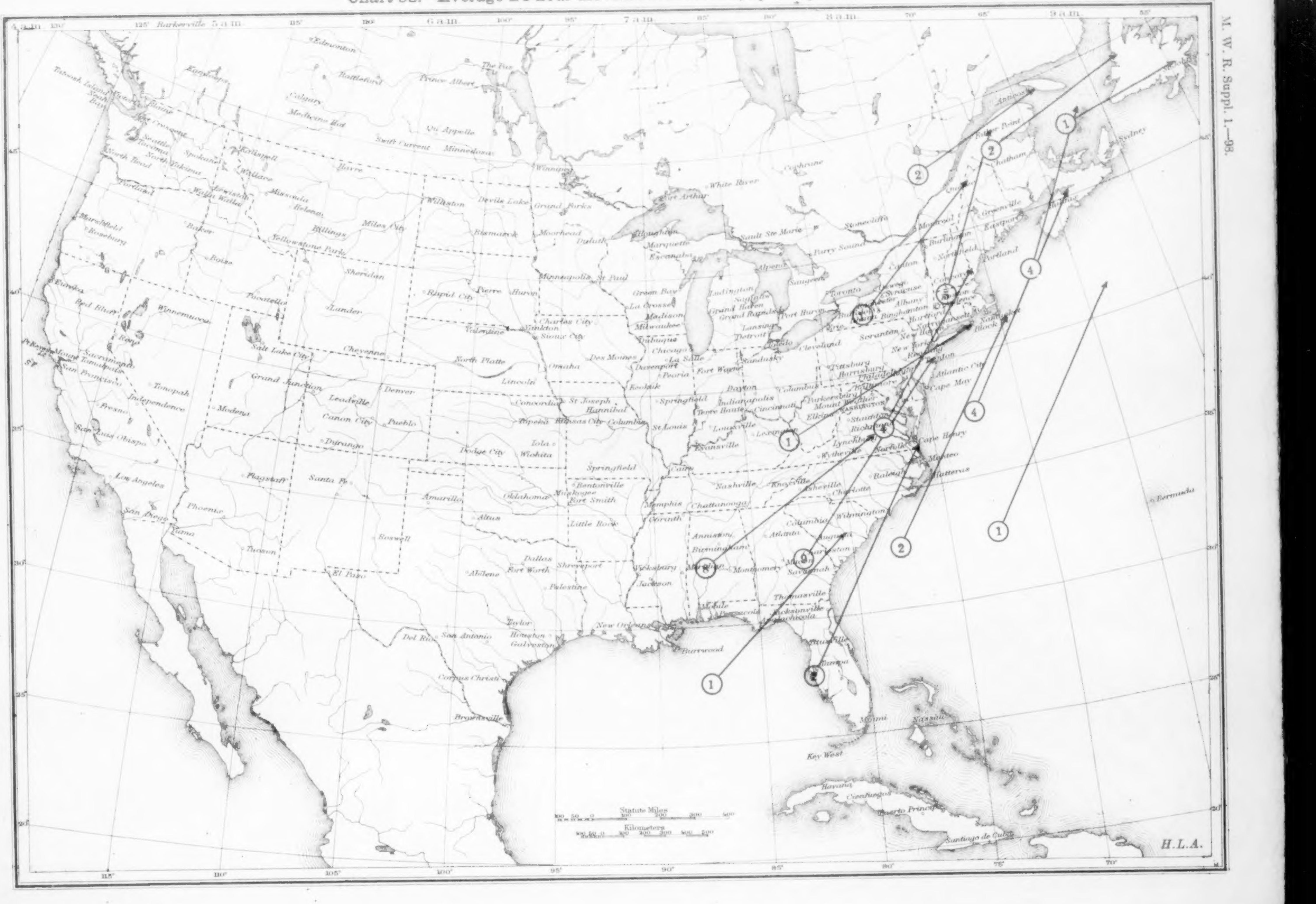


Chart 97.—Average 24-hour movement of storms, by 5° squares.

November—Texas type.

Chart 98.—Average 24-hour movement of storms, by 5°-squares. November—East Gulf type.



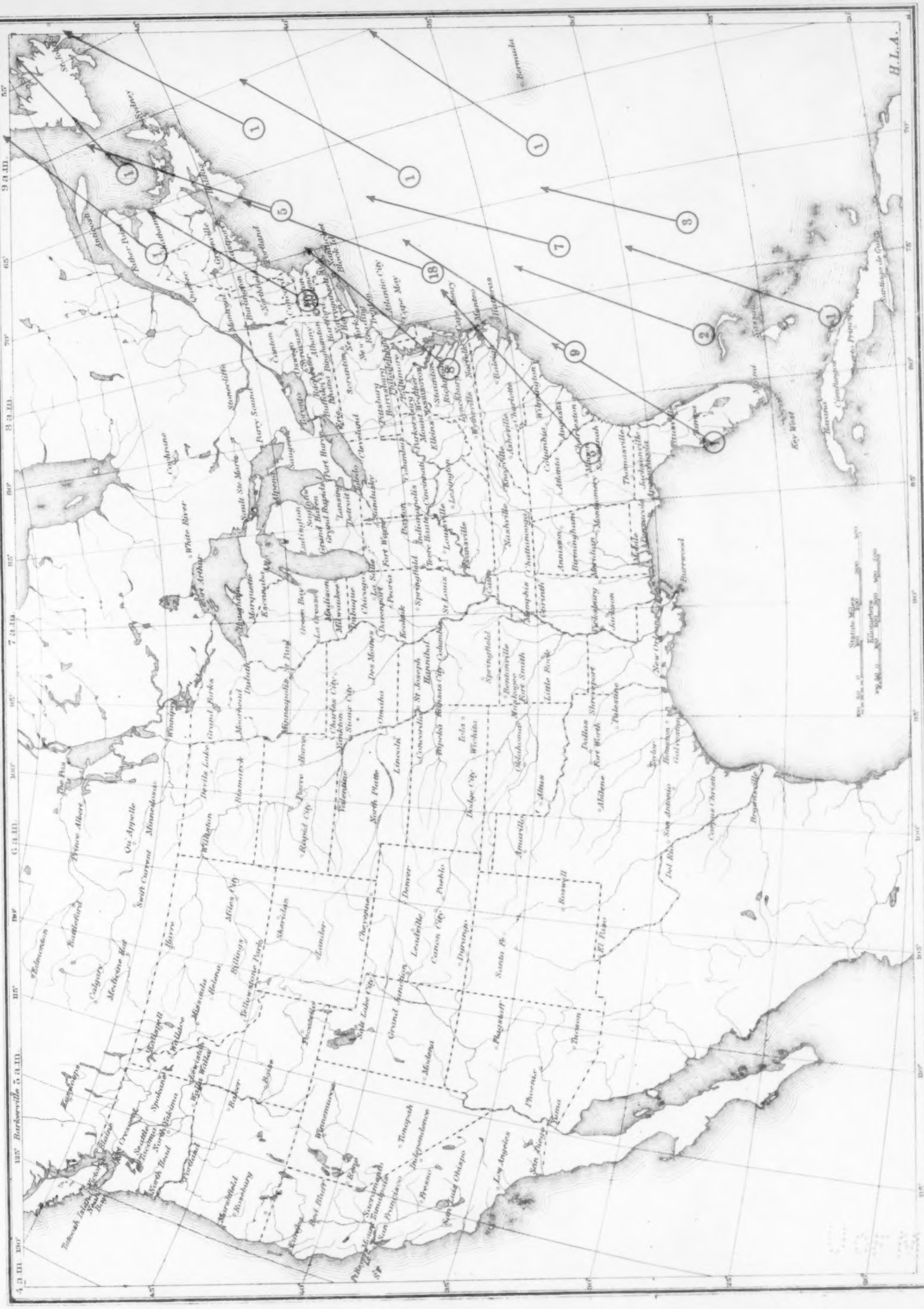


Chart 99.—Average 24-hour movement of storms, by 5°-squares. November—South Atlantic type.

Chart 100.—Average 24-hour movement of storms, by 5°-squares.

November—Central type.

Chart 101.—Average 24-hour movement of storms, by 5°-squares. December—Alberta type.

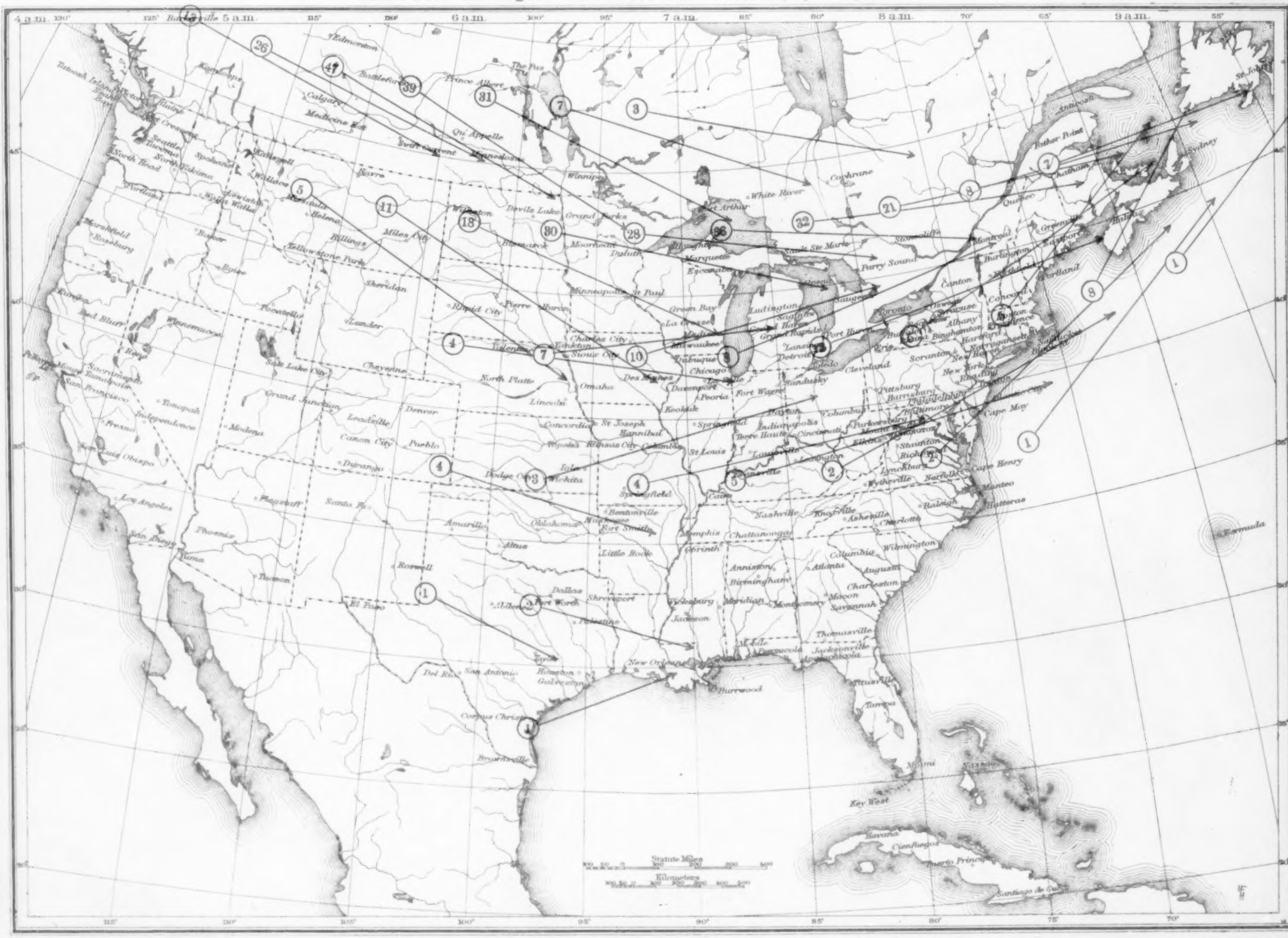


Chart 102.—Average 24-hour movement of storms, by 5°-squares. December—North Pacific type.

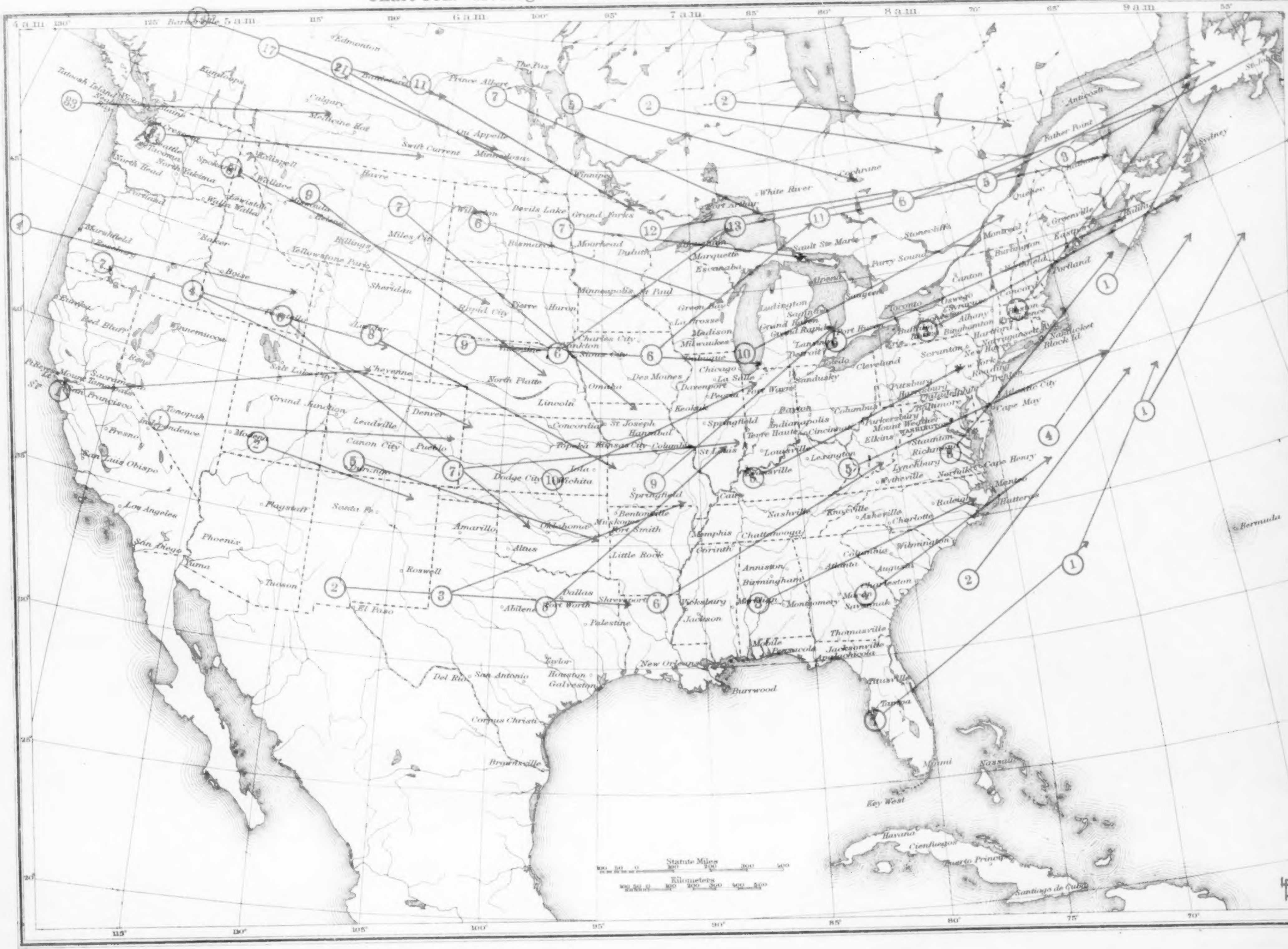


Chart 103.—Average 24-hour movement of storms, by 5°-squares. December—South Pacific type.

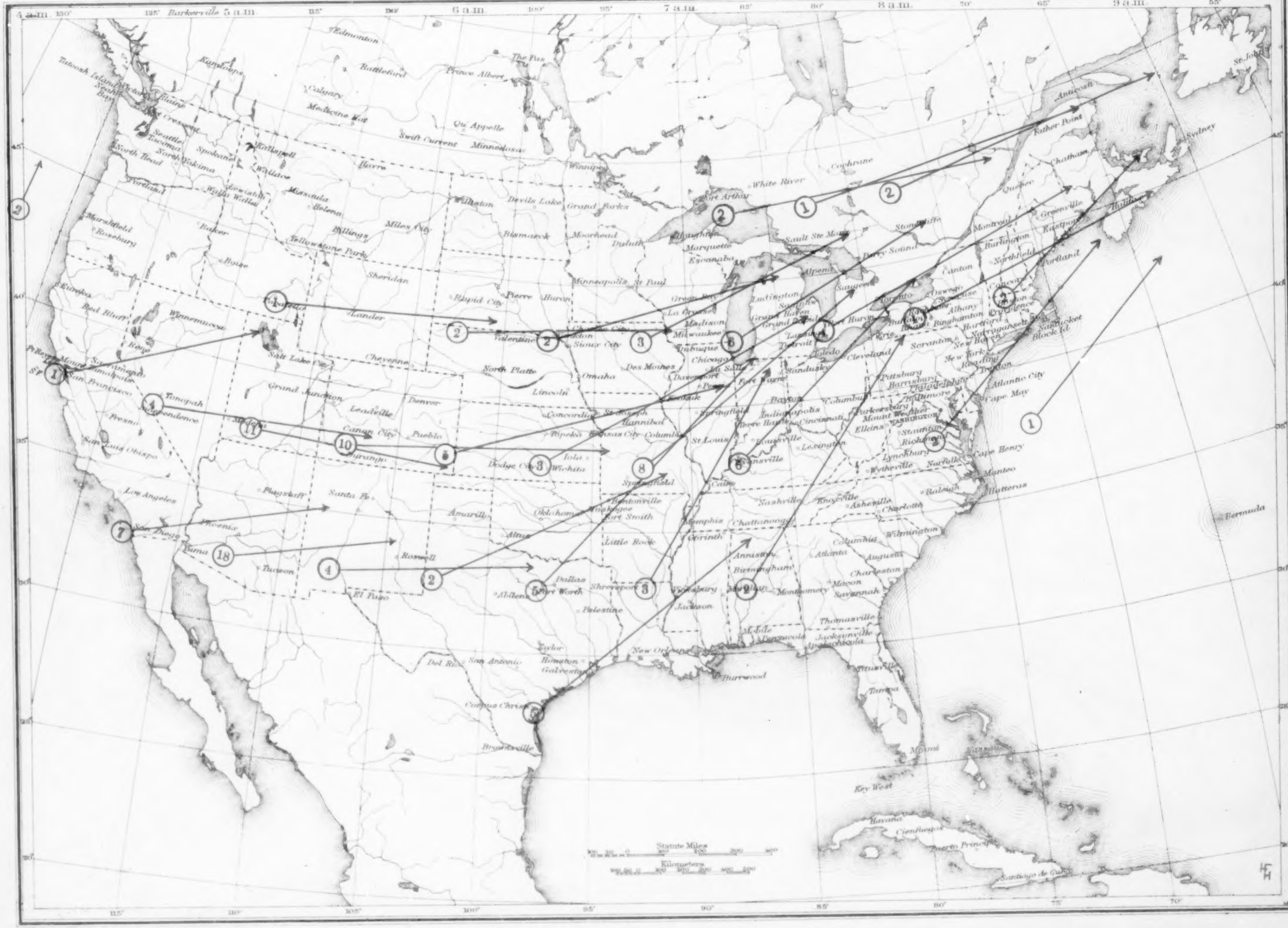


Chart 104.—Average 24-hour movement of storms, by 5°-squares. December—Northern Rocky Mountain type.

Chart 105.—Average 24-hour movement of storms, by 5°-squares.

December—Colorado type.

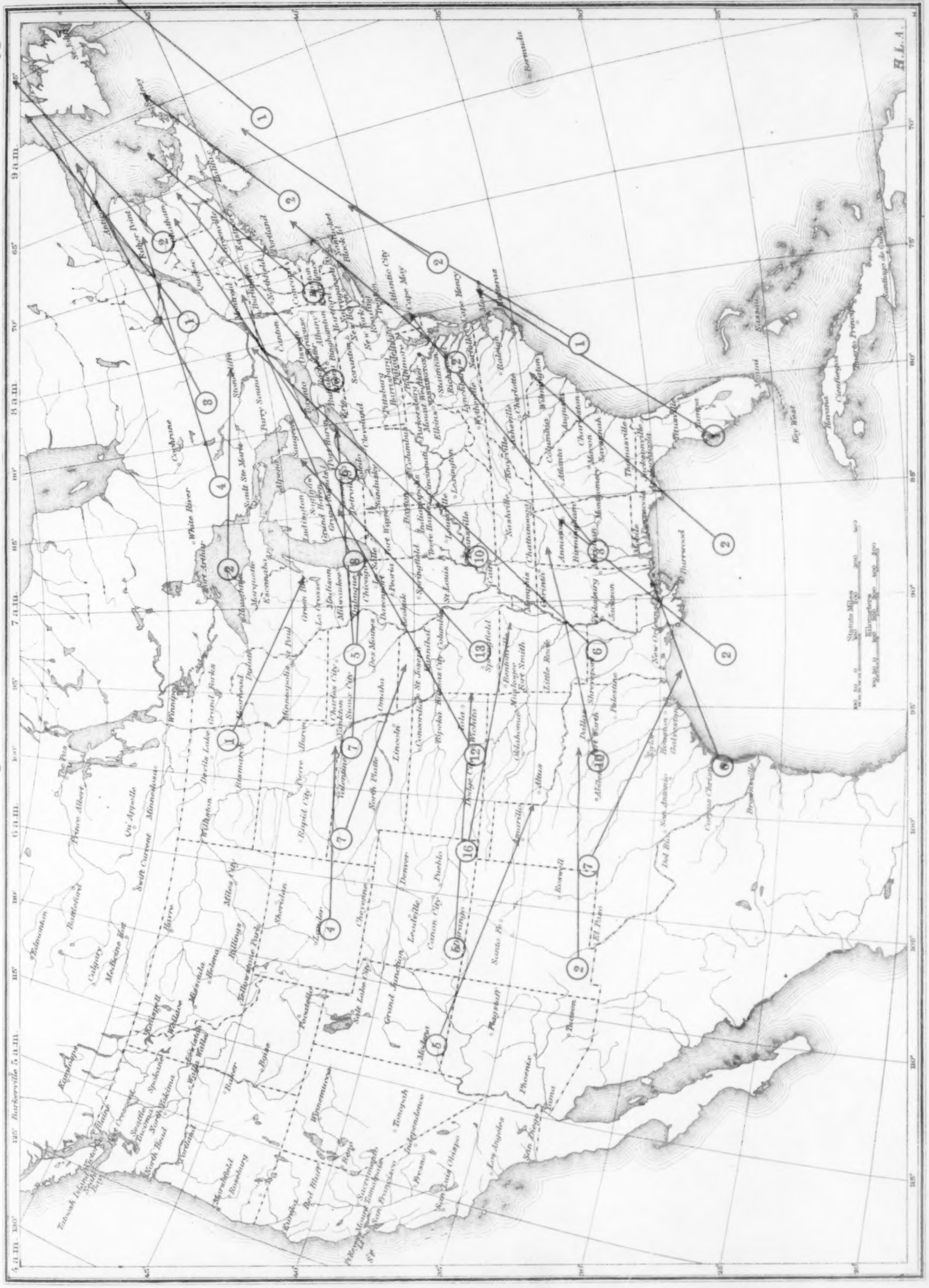


Chart 106.—Average 24-hour movement of storms, by 5° squares.

December—Texas type.

Chart 107.—Average 24-hour movement of storms, by 5°-squares. December—East Gulf type.

Chart 108.—Average 24-hour movement of storms, by 5°-squares. December—South Atlantic type.

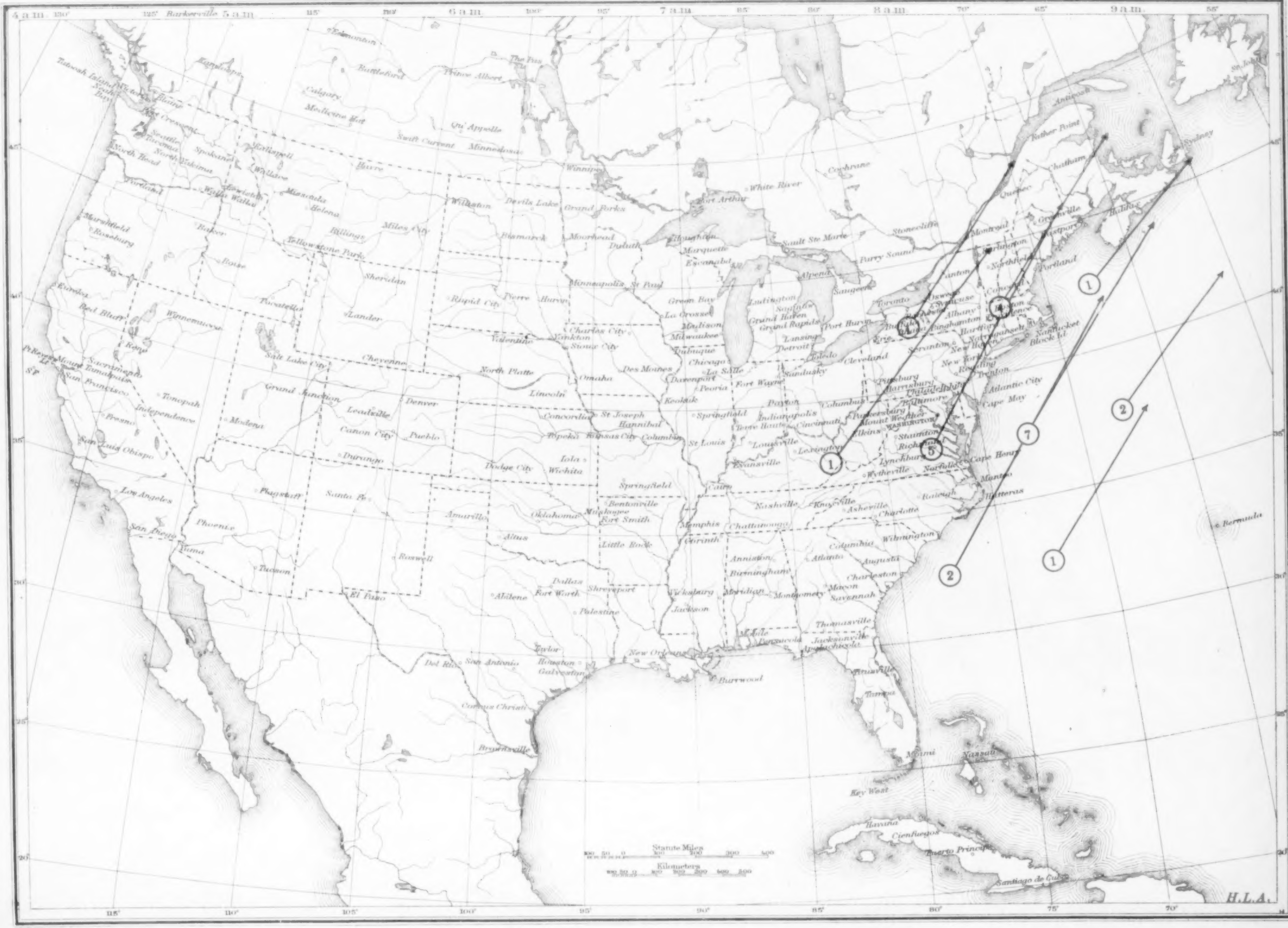


Chart 109.—Average 24-hour movement of storms, by 5°-squares.

December—Central type.

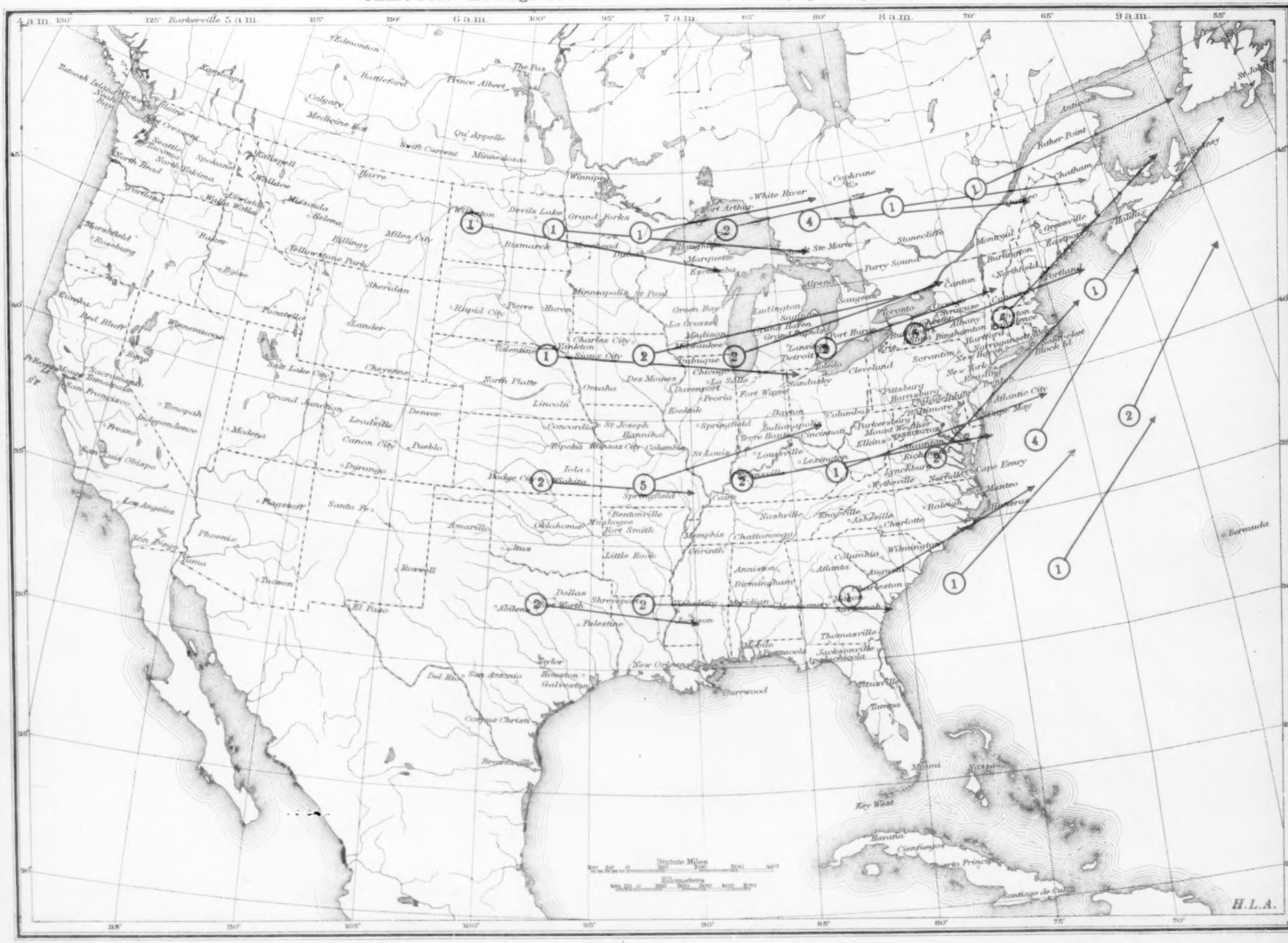


Chart 110.—Average 24-hour movement of storms, by $2\frac{1}{2}^{\circ}$-squares.

June—West Indian type.

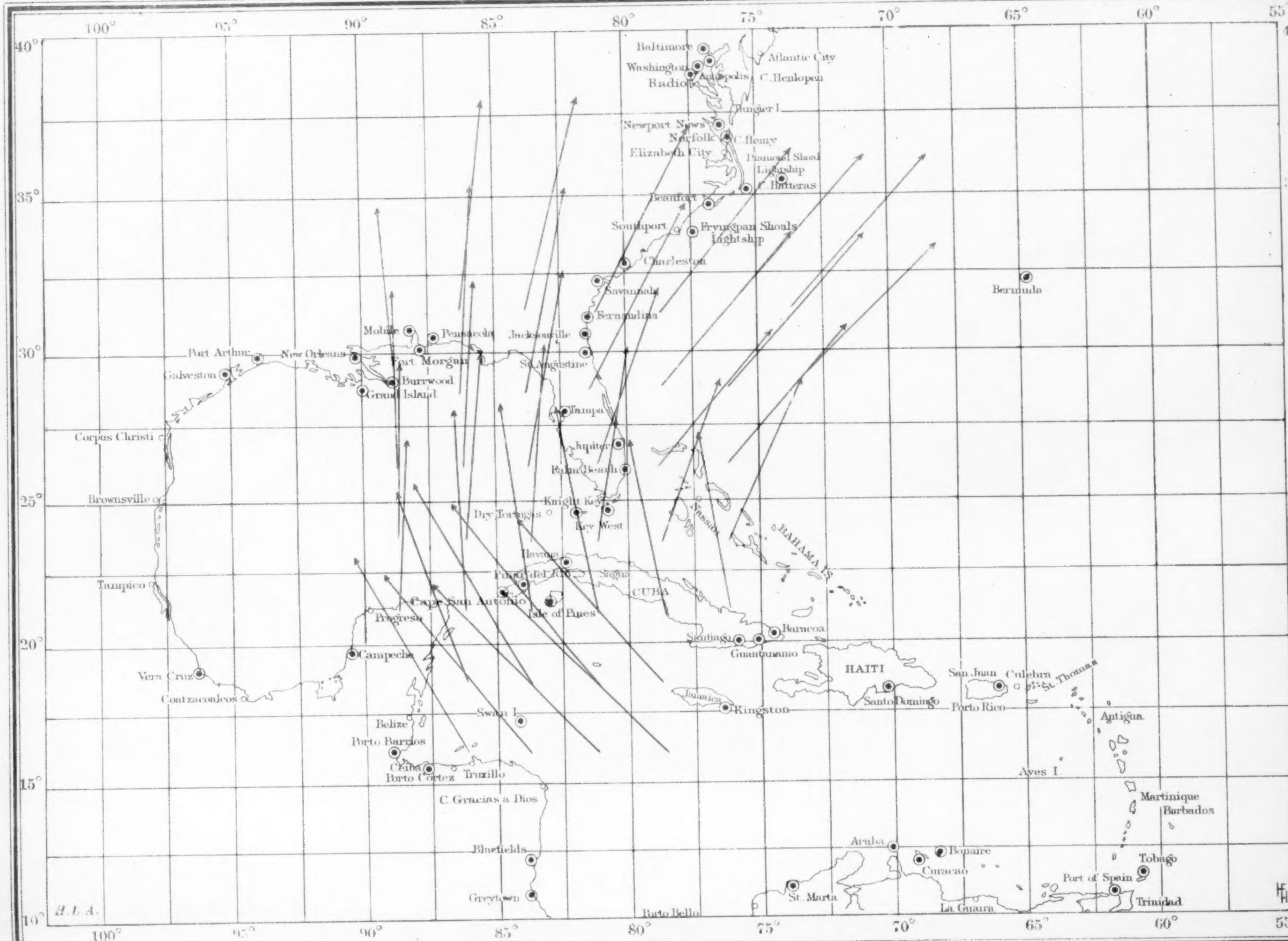


Chart 111.—Average 24-hour movement of storms, by $2\frac{1}{2}°$-squares.

July—West Indian type.

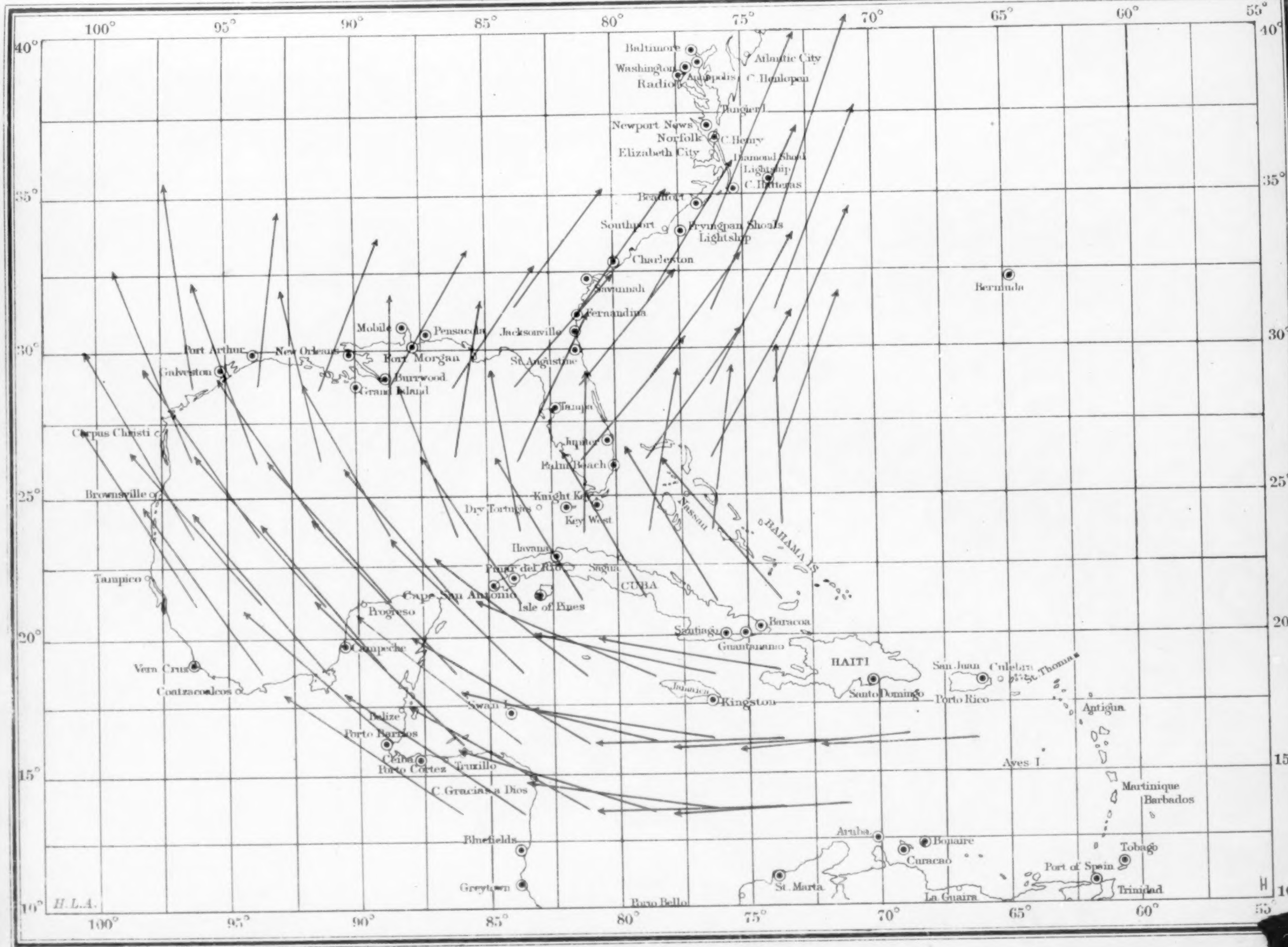


Chart 114.—Average 24-hour movement of storms, by $2\frac{1}{2}°$-squares.